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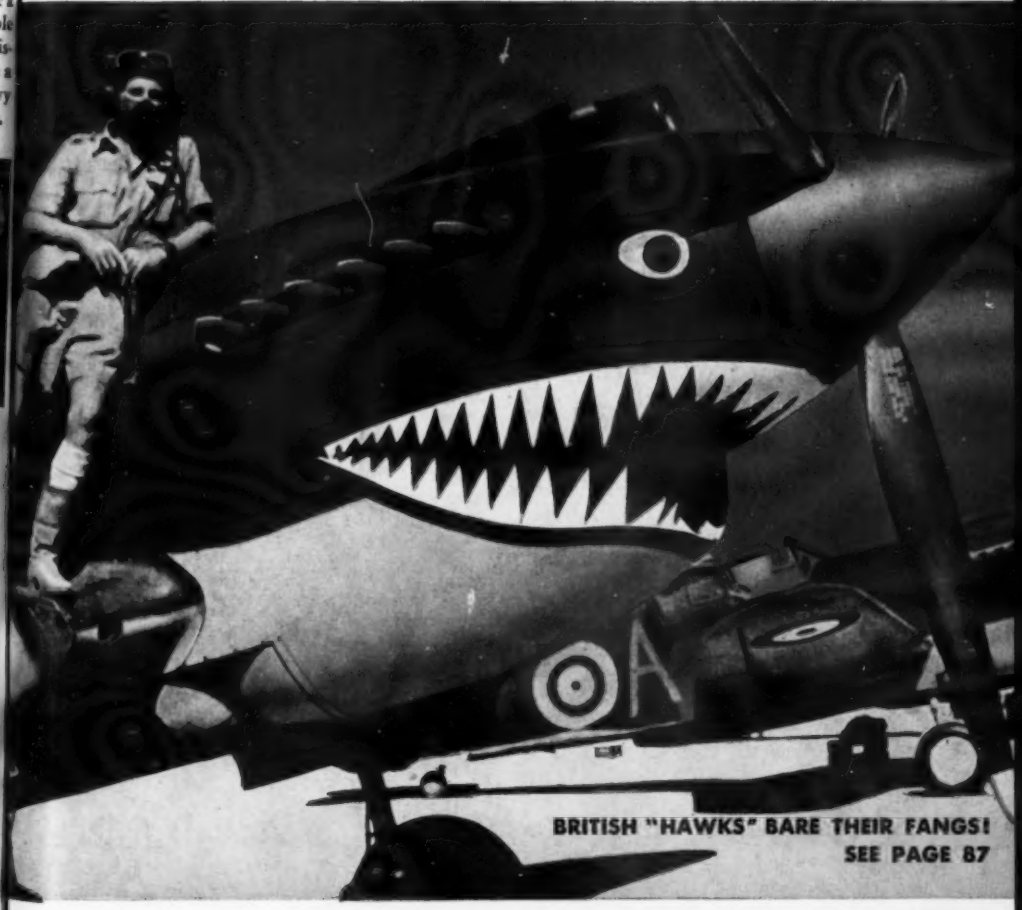

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APRIL
1942

Volume XXVII
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WILLIAM SEABROOK

William Seabrook, author, explorer and adventurer, whose article, "Professor Wood—Eminent Screwball Of The Laboratory," appears on page 40, is undoubtedly the best prepared writer in America to tell the story of this distinguished scientist with the overgrown sense of humor. For Mr. Seabrook has just published an entire book about Professor Wood entitled, "Doctor Wood, Modern Wizard" (Harcourt Brace & Company, $3.75). Born at Westminster, Md., and educated at the University of Geneva, Switzerland, Mr. Seabrook served with the French at Verdun and ever since the last war has adventured in the strange places of the world. Some of his books are "The Magic Island," "Jungle Ways," "Adventures in Arabia" and "The White Monk of Timbuctoo." "Doctor Wood" was his first experiment in civilized biography and Mr. Seabrook says the reason he was chosen to do the job is that Dr. Wood is as unconventional a figure as any African cannibal king.

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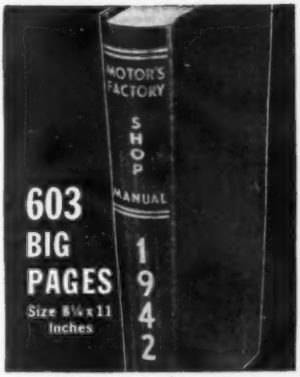

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NEW PRODUCTS AND INVENTIONS

LATEST HOME AND SHOP DEVICES • POPULAR PATENT IDEAS

GOSSIP OF DEFENSE AND INVENTORS

by Morton Leese

After more than a century of service to inventors, the Patent Office examining corps leaves Washington, D. C., to vacate space for the rapidly expanding defense effort in the nation's capital. The staff will be located in Richmond, Virginia.

Many of the facilities of the Patent Office, however, will remain in their present location in Washington. Particularly scheduled for removal are the sixty-five examining divisions. The public Search Room and the Scientific Library, as well as many of the bulky files, will remain available in Washington for inventors and their patent attorneys.

This new simplified supercharger can be installed on an automobile motor in only five minutes, and requires no other tool than a screwdriver to do the job. It is said to effect savings in operation of 10 percent or better. An air cleaner is incorporated into the supercharger to remove dust and dirt from the air that is sent to the cylinders. Costing only a fraction of the usual price of a conventional supercharger, much of its efficiency is attributed to the fact that it supplies the air and gas mixture more evenly to the cylinders at the ends of the motor. As these cylinders are located farther from the carburetor, they are sometimes slightly "starved." A more balanced engine performance is said to result from the new device, adding pickup to the car, and saving a gallon of gas in each ten. It is adapted to the modern down-draft carburators, and is shown installed on one. Note large inlet.

* * *

A recent demonstration of a "Spy-Catcher" threw the Patent Office into a furore. It is reported that an inventor appeared with such a device to demonstrate to officials of the National Inventors Council and the Patent Office. The spy catcher was a large box which suddenly raised a noisy warning: "Help, police, fire, save me, get out you dirty spies, etc." It seems that the spies were supposed to stumble over the box and set a record playing which emitted the shrill warnings. Problem—first catch the spies.

This newly introduced snow plow fastens to pleasure car bumpers by means of padded hooks. According to the manufacturer it can clear a path 440 feet by 6 feet in one minute. It is made of steel and oak, and weighs 80 pounds. No bolts are used to clamp it on. It folds up for storage.

* * *

There's a rather funny story attached to the patent on the now famous Northrop Flying Wing. As the machine was of possible major importance in a military way, everything about it was kept a deep secret. Design patent No. 127,185 was issued for the design, to John K. Northrop last summer. (The War Department has the privilege of examining patent applications before they are awarded, so that proper restrictions may be applied where necessary.)

The design patents section of the Patent Office's Official Gazette is usually concerned with such things as dolls, women's dresses, and toys, so the Flying Wing apparently didn't look too important. The result was that the drawings of the Northrop plane were published in the monthly issue. The rest is history—and all the world knows it.

[Continued on page 23]

These adjustable faucet handles have recently been introduced to fit any size or shape stem. A wrench comes with each pair to tighten them without scratching. The handles screw against stem. In place, adjustable feature is hidden.

INVENTORS

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Chips from the Editor's Workbench

Last Call

IF YOU haven't already started out after that Aeronca Defender Trainer airplane, the Crosley Sedan, the Atlas lathe, or one of the other grand prizes in MI's Second Annual Contest, then by all means turn to page 66 at once and start to work! Only you'll find it actually isn't work. You'll find the MI "Words-Within-Words" game one of the most fascinating games you've ever played.

But remember: This is your last chance! Get going today!

War Machine "Bugs"

BYRON PRICE, chief censor of the U. S., said in a recent broadcast that the greatest danger of censorship during war time is not the danger of revealing information to the enemy, but the danger that the press will forget its duty to give constructive criticism.

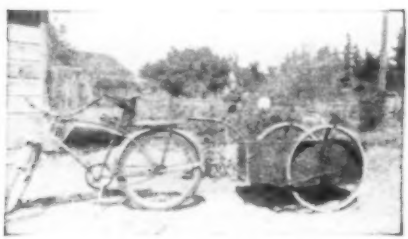
We feel considerable pride, therefore, in presenting Major Malcolm Wheeler-Nicholson's authoritative article, "How Good Are Our War Machines?," which starts on page 46 of this issue. We feel that Major Wheeler-Nicholson's objective and hard-hitting analysis of America's tanks, and particularly of America's *anti-tank* defenses, is of great value and importance, as well as being of wide interest.

You will discover in this military expert's exposition of his subject that a great many "bugs"—some of them serious—have developed in our war machines. You will also learn, to your relief, that most of them are being corrected.

Since our homes and our very lives depend upon perfection in our war machines, this is an article which should be read with vital interest by everyone who is an American.

"I thought you would be interested to see that we in South Africa also appreciate your MI every month," writes Mr. Neville Cox. Mr. Cox lives at Lulworth, St. Kilda Road, Lansdowne, Cape Flats, Cape Province, South Africa. The graceful table shown in the snapshot above, is his handiwork, and was built from plans in the February, 1940, issue of MECHANIX ILLUSTRATED. Made entirely of teak, it is undoubtedly a beautiful piece of furniture.

Now that the snapshot of Mr. Cox's excellently made ornamental table has traveled all the way from South Africa, the $5.00 Workbench award which it brings him will have to travel all the way back again. So will his Workbench Certificate of Merit.



A. R. Davis, of 1233 Temple Ave., Santa Rosa, Cal., built this handy bike trailer. Much of the material used in it was salvaged from an old day bed. The wheels, as can be seen, are standard bicycle wheels. The drawbar that hooks the trailer to the bike, is a ½-inch pipe. In order to permit the trailer to move freely in all directions as the bike turns or tilts, a ball and socket joint is used as a coupling. Mr. Davis tells us that he has hauled more than 200 pounds in this little trailer with ease. It certainly looks like a sturdy job. A $3.00 Workbench award and a Certificate of Merit go to Mr. Davis for this snapshot.

Subs

WITH American ships being sunk in American waters quite regularly and the submarine menace apparently increasing day by day, it may surprise you considerably to read the story, "This Is The Sub's Last War," beginning on page 35. Mr. Hartshorn, the author, sets forth a truly amazing group of facts leading to his conclusion that the submarine is becoming an obsolete weapon.

Editor's Workbench Chips

We are not at liberty to reveal certain facts concerning the Nazi attacks on our shipping off the Eastern Seaboard, but possibly by the time you read this these facts will have been announced publicly. And when they are, we feel you will be more inclined to agree with Mr. Hartshorn's theory.

Meanwhile, bear in mind Secretary Knox' rather cryptic statement to the effect that "not all of these submarines attacking us are going to enjoy a round trip home!"

MI "Luck"

TWO readers have written in this week to comment on "MECHANIX ILLUSTRATED luck." The first one remarks that we were lucky to hit the newsstand with our March issue bearing a cover picture of a Navy PT boat, a picture story of PT boats in action, and a how-to-build article on a model PT boat—and all of this during the week in which two real PT boats executed sensational "sneak" raids in Philippine waters, sinking two Jap transports.

The second reader says we were lucky to hit the newsstands with the same issue containing

[*Continued on page* 14]

William A. Keefer, of 1302 8th Ave., Sterling, Ill., built this good looking garden tractor from old farm implement parts. He tells us that most of the material used was salvaged from the junk yard. Power for the little tractor is provided by a 1¼ horsepower Briggs and Stratton motor. "I got the idea from reading MI Workbench Chips," Mr. Keefer writes. He also says that the little outfit makes short work of the weeds. For this snapshot of his well made tractor, Bill gets a $3.00 Workbench award and a Certificate of Merit.

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Editor's Workbench Chips

[*Continued from page* 13]

Lieutenant Douglas Rolfe's article on "Aerial Navies" at the moment that Flying Fortresses were shooting down Japanese pursuit planes by the dozens in the Western Pacific. If you will remember, Lieutenant Rolfe predicted in his article that larger planes would soon be shooting single-seat pursuits down, as a matter of course. The Lieutenant didn't realize how soon!

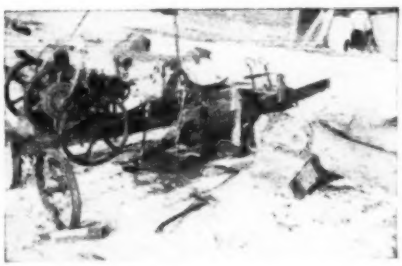
We can only say to these two readers: "If this is MI luck—then let's have lots more of it!"

Materials "Scarcity"

WE THINK the story starting on page 58 of this issue is going to prove to be right down the alley for all the workshoppers who read MI. Most of you hobbyists have been reading the stories from Washington about priorities and shortages and have probably decided by this time that you would soon be locking up the basement workshop for lack of anything to work on.

War is going to cut down on a number of materials—no doubt about it. But we believe you'll stop worrying as soon as you read Bertram Brownold's article. As a matter of fact, we believe the ideas this article will put into your head will suggest so many other ideas to each of you that the whole thing will increase your enjoyment of your shop. For, after all, the greatest kick we all get out of our shops is the exercise of our ingenuity. And if you follow Mr. Brownold's hunch, workshopping is going to become more of a game than ever!

We won't tell you more about it here. But we



Cecil Gombert, of 60 Ruie Rd., N. Tonawanda, N. Y., built this unusual log sawing outfit. The slide action arms and gears were taken from an old steam engine, and the running gear salvaged from an old car. The wheels can be turned sideways as shown for rolling the machine along the log being cut, or turned forward when the entire machine is to be towed. An automobile clutch is used to engage and disengage the motor. Ice tongs hold the log firmly for sawing. "The outfit will saw through a three foot log in about ten minutes," writes Cecil. That's certainly a good deal easier than sawing it by hand.

Mr. Gombert is also building the P. H. Dustmaster Enlarger. That particular enlarger can be built from plans and instructions contained in a phamphlet available from Fawcett Publications Inc., Greenwich, Conn., at 25 cents. But to get back to the saw, its builder receives a $3.00 Workbench award and a Certificate of Merit.

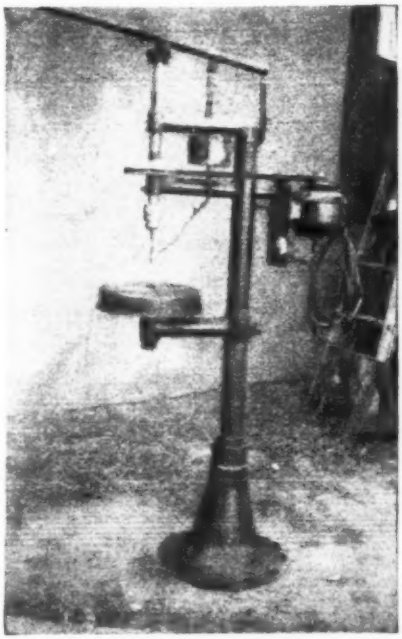
Editor's Workbench Chips

urge every workbencher to turn to Mr. Brownold's article at once.

Puzzle

SOMETIMES it is exceedingly difficult for editors to determine whether a particular feature is really interesting to the readers. Such a feature is MI's "Cryptorithms," which we have been running for several months now. We thought it was a good puzzle. But reader reaction to it has proved to be more of a puzzle to the editors. How

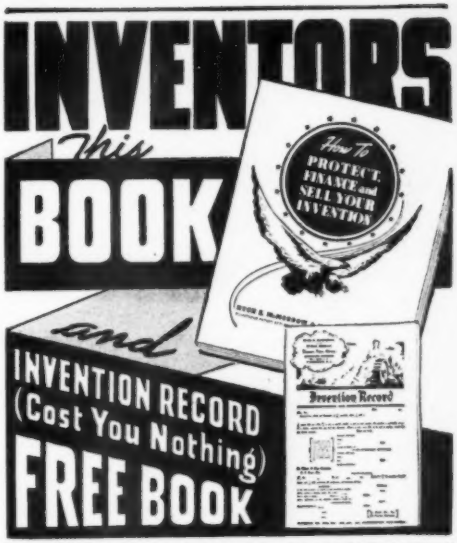
[*Continued on page* 16]



With machine tools at a premium for defense production, this drill press bears out the old saying "Where there's a will there's a way." Dwight C. Walker, of 1018 South Division St., Charleston, Ill., built it principally from scrap parts. The base is made from the rear housing of a Fordson tractor. The upright is made from the inner drive shaft tubing of a Ford truck, and the rest of the machine mainly from pipe.

Mr. Walker says that after welding together and grinding, the outfit looks like a regular one-piece job. He used V-belts instead of flat ones, so that he'd get the performance he wanted without undue belt tension. Another neat trick is his motor mounting set-up. As the motor is mounted with the shaft vertical, the weight of the armature in some motors might cause it to slip down, causing added friction or possible damage to the motor. Mr. Walker's scheme consists of an old lathe center with its point inserted in the center hole on the lower end of the shaft. The lathe center acts as a vertical thrust bearing, supporting the weight of the armature. Mr. Walker says he'll be glad to answer questions from MI readers concerning his drill press.

Plans for a drill press made from pipe fittings were contained in the January, 1942 issue of MECHANIX ILLUSTRATED. For this snapshot of his drill press, Mr. Walker receives a $3.00 Workbench award and a Certificate of Merit.



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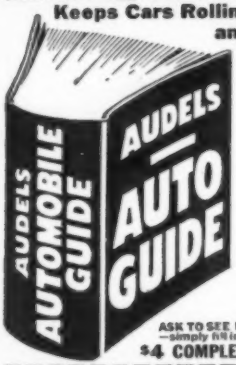

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Editor's Workbench Chips

[*Continued from page* 15]

about it, MI readers. Do you like "Cryptorithms," or should we use the space for some other purpose? Let us know.

Pacific Post

MOST traveled letter of the month comes from MI reader J. A. Mouw in Balai Sepoeak, W. Borneo, Netherlands East Indies. Mr. Mouw informs us that he lives in the jungle where plywood is unobtainable, but nevertheless he is building himself a *Scram III*, using exotic native timber instead. His communique was mailed the latter part of October, and by this time Mr. Mouw has probably had to lay aside his boat tools temporarily in favor of stronger tools for a bigger job that must be finished first. But he'll be getting

This extraordinary conveyance is the Mutz Blitz Bug. Containing parts from fourteen different makes of cars dating from 1914 to 1941, its design and construction is the work of Edmund (Mutz) Wirfs, of McHenry, Ill.

The majority of the car is 1928 Ford, held down by 400 pounds of cement ballast—necessary when the 79-inch wheel base powerhouse is driven at its top speed of 85. Designer Wirfs tells us that the rear spring suspension is his own idea—and indeed, he seems to have plenty. Despite its rather imposing ballast, the amazing Mutz Blitz Bug gets 30 miles on a gallon of gas, and that's economy few cars capable of 85 m.p.h. can boast of.

Mr. Wirfs gets a $3.00 Workbench Award and a Certificate of Merit for this remarkable example of automotive originality.

This is not a man from Mars, but a diving helmet built by Thomas H. Kelly, of 2706 Duncan St., Louisville, Ky. Tom didn't tell us in his letter whether he's the person shown in the helmet or whether he took the picture. The body of the helmet was made from a 100 lb. carbide can weighted with sash weights and lead. The shoulders of the helmet are padded with garden hose. A $1.00 bicycle pump supplies the air through 30 feet of hose, and according to Tom, it does a good job. He has made several 14-foot dives with the outfit in the Ohio river. "I have always been an ardent reader of MECHANIX ILLUSTRATED." Tom writes, "and I think your magazine is really a greater value than ever before . . ." That diving outfit looks pretty good, too; and it brings Mr. Kelly a $3.00 Workbench award and a Certificate of Merit.

Editor's Workbench Chips

back to his *Scram* by and by, and when he does, may he have lots of good sport and fishing with it. In the meantime, Mr. Mouw, *good hunting!*

Incidentally, *Scram III* is that flashy 15½-ft. inboard runabout that many of you will recall appeared in plan form in HOW TO BUILD 20 BOATS, No. 5. It's been a very popular craft, and in case you're interested, blueprints are still available at the same old price, $1.50 (Blueprint No. 936).

Which reminds us to remind you that the very latest edition of that famous publication (No. 7) is now on sale at your newsstand. It's packed with a fine assortment of NEW boat plans, twenty in all, plus a number of general-interest boating articles. Many of you have been asking about 3-point suspension speedboats, and you'll find the real low-down on them in this book. If you're a boat lover be sure to pick up a copy of HOW TO BUILD 20 BOATS, No. 7, whether you live in Battle Creek or Batavia.

Mistaken Identity

THERE'S an interesting little story in connection with the article, "Flag Initials For Your Car,"

[*Continued on page* 18]

Joseph Hlasney, Jr., of 152 Lafayette Ave., Palmerton Penna., built this model airplane. Although he has built about 35 model planes he writes, "Its performance in the air is the best of any other plane that I have built." It has a 54-inch wing spread. Joseph has also built model boats and model trucks. It looks as though he's doing a good job at that too, judging by this snapshot—which brings him a $3.00 Workbench award and a Certificate of Merit.

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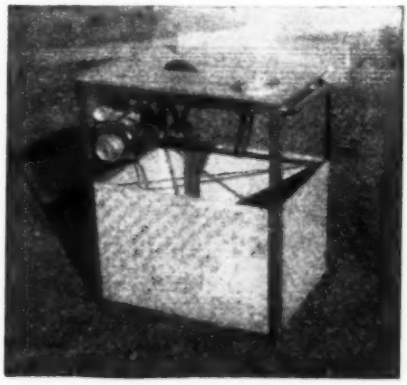
Editor's Workbench Chips

[*Continued from page* 17]

on page 101. It seems that the author, Walter E. Burton, shortly after applying the initials to his new car, happened to drive out to a certain Naval Training Station to visit a friend on duty there.

At the gate he was stopped by the sentry, who looked at the car, looked at the initials and then waved him to the side of the road with a big grin. He disappeared into the sentry booth and

[*Continued on page* 20]



Charles C. Brown, of 201-15 Ave., Council Bluffs, Iowa, built this circular saw outfit from start to finish. He even cast the table, motor mount, and saw guides from patterns he made himself. The saw has a 10-inch blade, which any workshop fan knows is big enough to handle any job the average hobbyist is likely to run up against. All the machining on the saw was also done by Mr. Brown, on his lathe. A $3.00 Workbench award and a Certificate of Merit go to Mr. Brown for this fine example of all round shop work.

Built by Allan McHardy, of 53 Columbus Street, East, New Westminster, B. C., this car with its "souped up" Model T engine, is capable of 85 miles per hour. The engine now has a down draft carburetor, overhead valves, counterbalanced crankshaft, fuel and oil pumps, and special large size manifolds. The radiator has been removed in the photograph to show the motor. It looks like a very neat job, and judging by its speed, it's a very efficient one.

"I am a keen reader of MECHANIX ILLUSTRATED, especially the Editor's Workbench," Allan writes. "Would also like to hear from some other motor builders." We're sure many auto and engine enthusiasts will appreciate Allan's invitation to communicate with him. He certainly seems to know his stuff on automotive matters. A $3.00 Workbench award and a Certificate of Merit are his for this snapshot.

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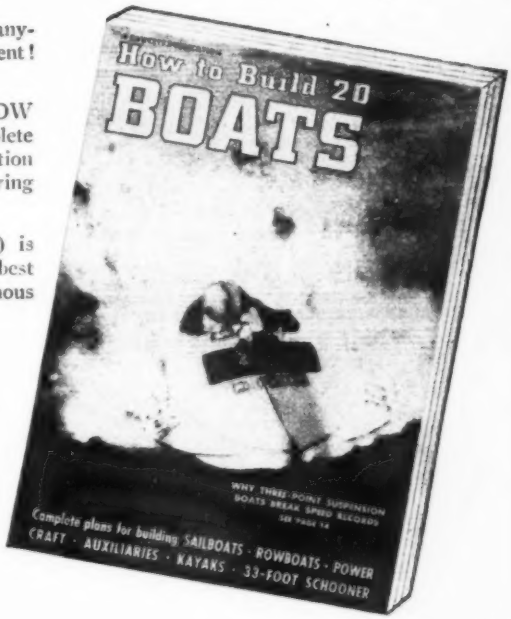
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Editor's Workbench Chips

[*Continued from page* 18]

talked briefly on the phone. A moment later a bluejacket hopped into the car alongside our author and directed him to follow a road to the right. Thinking that this was the usual procedure, Burton obeyed and said nothing. Pretty soon they arrived at a nice looking house and the sailor told him to stop, beckoned him out of the car. "Any instructions or do you want to get on back to town?" said the seaman, 1st class.

Our hero was flabbergasted but managed to sputter something to the effect that there must be some mistake.

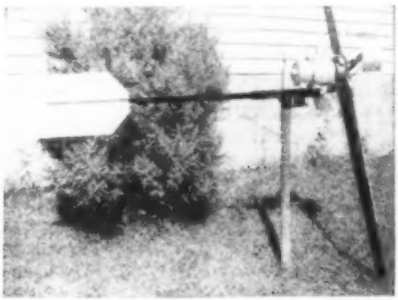
"Isn't this the Commander's new car?"

Finally Burton got directed to his friend, after the whole mess had been straightened out. You guessed it—the Commanding Officer had just bought his wife a new car, and her initials were *W.E.B.!*

Today's Trivia

A GLUE manufacturer, who shall remain anonymous, has sent us a long form letter in which he complains bitterly because the press, magazines, and people in general insist on calling glue "plastic." Here's a quote from this document:

"For some time back now I have been reading articles . . . about *plastic* airplanes, but I submit that these are nothing more or less than glued up plywood formed into the proper shapes . . . I believe it is time to call a glue pot a glue pot."



This neat looking windcharger was built by G. F. Harvard, R.F.D. 2, Bradford, Ky. All it cost in cash was $3.00, and according to its builder, "This machine works fine." Mr. Harvard also says, "I have been a reader of MI for years, and think it is a fine magazine . . ."

As to the details of the charger, for the benefit of those who plan to build one for themselves, Mr. Harvard says it's made from an old Ford Model T generator, rewired for slow speed with materials secured from a MECHANIX ILLUSTRATED advertiser. It cuts in at about 150 r.p.m., and charges up to 12 amps. 6 volts.

It certainly seems to be a good job. Plans for a somewhat similar windcharger are contained in HOW TO BUILD IT No. 8, which is available at 50 cents from Fawcett Publications, Greenwich, Conn. The name of the charger in this book is the "Whirlwind" —Wind Electric Generator. Mr. Harvard's charger brings him a $3.00 Workbench award (which makes up his cash outlay in building it) and a Workbench Certificate of Merit.

Editor's Workbench Chips

It goes on to say how glue and gluing is an old and honorable art; nothing to be ashamed of, even if it is a bit on the smelly side.

Needless to say, our heart goes out in sympathy to the pitiful plight of this gentleman, even though we have a low suspicion that glue manufacturers themselves started calling glue "plastic" as a part of their sales campaigns. In all fairness, however, we are compelled to admit that our correspondent is quite right—glue and plastic are two different things with entirely different functions, a fact which MI has always recognized. We don't think our skirts are sticky . . .

Adventurer

A PHOTOGRAPH and brief biography of William Seabrook, author of "Professor Wood —Eminent Screwball Of The Laboratory" (starting on page 40), appear on the contents page of this issue. However, no one could begin to relate the history of this noted author in such a small space.

Mr. Seabrook, as you probably know, is the author of hundreds of books, short stories, articles, etc. He is perhaps most famous for his book, *The Magic Island*, which related the story of Voodoo.

Mr. Seabrook has spent most of his life wandering the face of the earth, seeking out its strangest places. He lived for a year with the Bedouin tribe of the Beni Sakhr in the North Arabian Desert and became a friend of King Faisal, King Abdullah in Transjordania, and was a house guest in the bombarded palace of Sultan Pasha Atrash in the mountains of the Druses, where that great hero made his last stand against the French. He has

[*Continued on page 22*]

This baby tractor was built by Mr. E. B. Rogers, of 254 Academy Street, Concord, N. C. Although Mr. Rogers used only hand tools on the job, the only things that are factory built on the tractor are the front wheels and the motor. The motor is a ⅔ horsepower Briggs and Stratton that was formerly used on a well pump. The steering wheel is sawed from ¾-inch plywood, and painted with silver paint. (Incidentally, that's a good way to make a steering wheel for miniature tractors and cars.) The whole tractor, aside from the wheel, is painted bright red.

Mr. Rogers wins a $3.00 Workbench award and a Certificate of Merit with this snapshot.

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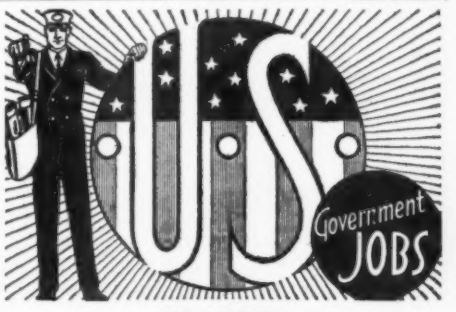

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Editor's Workbench Chips

[*Continued from page 21*]

lived with the natives in Haiti, and wrote a book, *The White Monk of Timbuctoo* as a result of his further travels.

Patter

A PICTURESQUE new language is growing up in our armed forces—a language a great deal like the patter exchanged by knowing Workbenchers. It's a language that only an insider can understand.

We thought you'd get a kick out of the new slang developing in the Army's Motor Transport Division. We picked up a few of their more colorful phrases on a recent jaunt to an army camp. Here are some of them:

"*Punctured lung*": This is the Army Transport man's phrase for a leaky truck radiator.

"*Shake down the ashes*": To crank a truck by hand.

"*Boom wagon*": A truck that carries munitions.

"*Screwballs*": Test drivers.

"*Meat wagon*": The ambulance, of course.

"*Ingersol*": The crank on a truck. "To Ingersol it," again, means to wind it up.

"*Pneumonia wagons*": Open jeep cars, which have no protection against the weather.

"*Cop-caller*": A truck with noisy brakes.

"*Emerjenson*": For some strange reason, this is

[*Continued on page 157*]

"That's my dad on the scooter—" Writes Dickie Childers, of 816 Monroe St., Galesburg, Ill. Dickie's dad also built the scooter (which is shown above). It weighs 200 pounds, has a ¾ horsepower Briggs and Stratton motor, and a chain drive. Dickie also says that he and his three brothers have a good time on the scooter. That's not all the scooter is good for, however, as it won first prize in a local workshop exhibit. "Dad" also built a walnut desk and chair which took second prize in the exhibit. For this snapshot of the motor scooter, Dickie's dad receives a $3.00 Workbench award and a Certificate of Merit.

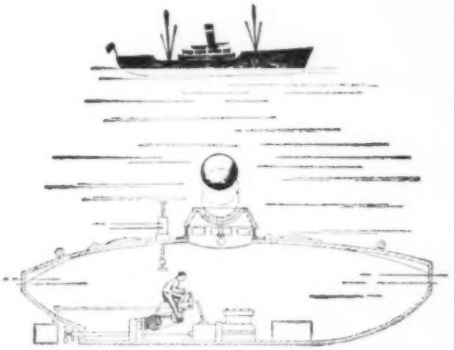
New Products And Inventions

[*Continued from page* 10]

During World War I, there was a decrease in the number of applications filed during the war period. However, after the war, industry again became active and the year of 1919 far surpassed any other year in the history of the Patent Office. The present conflict appears to be following a similar pattern. By analogy, a boom in patent applications may be expected at the close of World War II.

* * *

Youth will be served. Did you know that Perkin invented aniline dyes at the age of 18? Colt invented the revolver at 21, and Marconi received his first wireless patent at 21. Westinghouse invented the air brake at 22, and McCormick built his first reaper at the same age. Howe invented the sewing machine at 26, and Whitney invented the section gin at 27.



Defense continues to occupy our inventive

[*Continued on page* 24]

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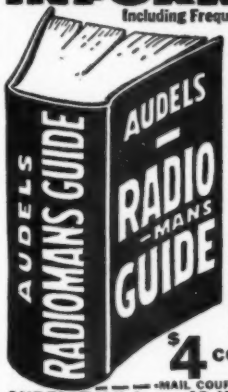

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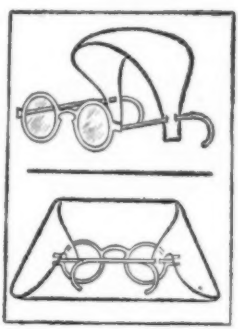
New Products And Inventions

[Continued from page 23]

minds. In a recent patent a submarine is provided with dish shaped pocket on top. The pocket is adapted to hold a mine, the mine being held by magnetic units in the pocket. The mine is released at the proper time by an operator in the submarine. To avoid being heard by an approaching ship, a bicycle type of sprocket and chain drive is provided for pedalling the submarine forward. The mine is released from its pocket by de-energizing the magnets in the pocket which holds the mine. **(Patent No. 2,262,348.)**

To avoid littering a person with cut hair, a new barber clipper has been provided with a vacuum bag attachment. The clipper is supplied with a suction motor and a bag not unlike that of a vacuum cleaner, with a tube leading from the clipper to the bag. A shoulder strap conveniently supports the fan, motor and the bag. (No. 2,263,775.)

• • •



A combination of a pair of eye glasses with a cover that also serves as a head piece is the subject of a recent patent. The side extensions of the head piece hold the ear bows of the glasses in place. The hood is so made and arranged that it may be folded about the glasses when the glasses are folded so as to form a protective casing for the glasses. In the folded position the hood protects the lenses on one side and the ear bows protect them on the other. (No. 2,262,142.)

In 20 years, water transportation on the Great Lakes has increased 65%.

Letters To The Editor

To the Editor:

Recently, while visiting friends, I thumbed through the November 1938 edition of MECHANIX ILLUSTRATED. This edition contains an article entitled "The Mummy Cloth Mystery," written by George H. Dacy.

My particular interest was drawn to the illustration on the lower left hand corner of page 58. The man shown bending over the plants bears a marked resemblance to my brother—a brother who disappeared mysteriously in 1933, and from whom we have never heard since. You will, I am certain, understand the ray of hope which presented itself when I saw this picture. And in this connection any help you might volunteer would be most deeply appreciated by myself, as well as the other members of my family.

Would it be possible to find out the name and address of the man in the illustration? Since he is shown in profile, we are not absolutely certain, but the resemblance is so striking as to erase doubt from our minds and to prompt this letter.

This request is, I realize, a great imposition, but if our assumption is correct and by this strange coincidence we may be able to locate our brother, our gratitude would know no bounds.

Mrs. A. Mielcarski
61 Mayer Avenue
Buffalo, New York

Unfortunately, our effort to learn the identity of the man in this photo was unsuccessful. However, the photograph was taken at the Plant Reduction Corporation Headquarters, Live Oak, Florida. An inquiry to them might prove more satisfactory.

* * *

To the Editor:

Since your article "Invisible Flash for Blackout Photography" in the March, 1941, issue of MECHANIX ILLUSTRATED, we have been having no end of fun taking pictures in complete darkness by the method recommended by Kenneth Murray. We couldn't be more sincere when we say we are grateful to you for introducing this new process.

Walter La Mere
Hayward
California

Since Mr. Murray's article was published, we have had hundreds of inquiries from interested readers asking where the dyes could be purchased. For your convenience, we are glad to recommend Fezandie & Sperrle, 205 Fulton Street, New York City.

* * *

To the Editor:

We would like very much to have permission to reprint the article entitled "Whiz Kids" by S. J. Johnson, as it appeared in the January issue of your publication. It would appear in *Science and Discovery*.

Rodale Press
Emmaus, Pennsylvania

* * *

To the Editor:

On Page 45 of the November 1940 issue of MI you have a picture with the caption "Keeping House in a Beer Barrel." The text describes huge beer barrels that were converted into tourist cabins, in Erie, Pennsylvania.

In view of the fact that the picture which illustrates your article is an exact duplicate of our Cabin No. 17, we are wondering if there could possibly be another such tourist camp in or near Erie, Pennsylvania as we are under the impression our cabins are the only ones of their kind in existence.

To give you a better idea of what these cabins are like we are sending you, under separate cover today, a series of pictures and would appreciate your advising us whether your article giving the location as Pennsylvania is an error.

R. S. Barr
Cask Villa
Vermilion, Ohio

Our mistake! The Barrel Cabin pictured in MI actually was at Cask Villa, Vermilion, Ohio.

[Continued on page 31]

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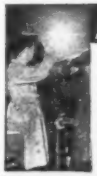

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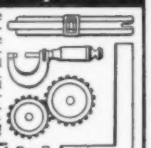

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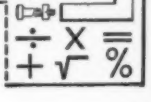

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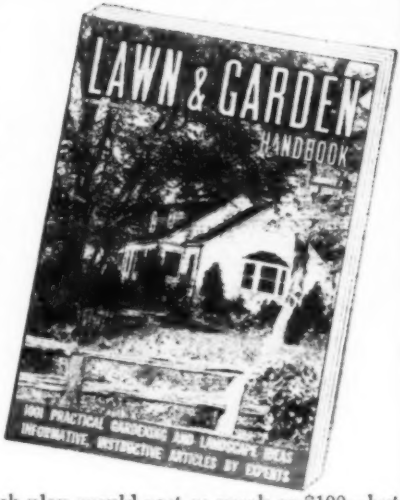

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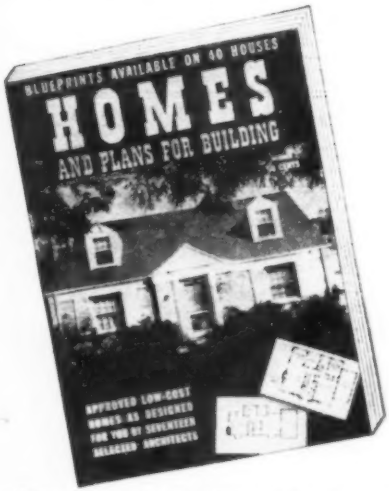
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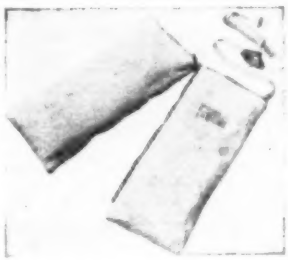

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Although the young lady above appears to be giving you a going over through her monocle, she actually is peering through a new lens destined to be used by U. S. Army doctors in examining the eyes of recruits. Hundreds of such trial lens sets, to determine how well the future doughboy sees, are now being produced and will be the standard for Army use throughout the country.

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WEEKLY RENTAL. 8mm. 16mm. films. 35c up. New catalogs. Dayton Film, 2227 Hepburn, Dayton, Ohio.

USED 16mm. sound film—100 feet $1.00, postpaid. Blackhawk Film, Davenport, Iowa.

HOME MOVIES

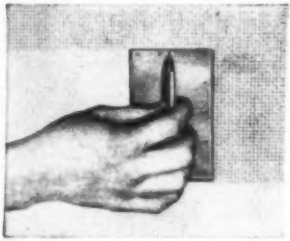
MOVIES, 1942 LIST Free; sample film 10c. Cameras, projectors, accessories. Goodwill Company, Jackson, Tenn.

AUTOMOBILES—MIDGET CARS

WHIRLGAS SUPERCHARGERS, $3, increase mileage 20%; power 10%. Refund guarantee. University test. Any car; give make, year. Wrench installs 15 minutes. John Hanley, Manufacturer, 5719 Loraine, Detroit, Mich.

MIDGETS, MOTORSCOOTERS, building kits. Closing out! Free circulars. List 50 used motors ($5.00 up), 20c. Shipps Midgets, Box 543-B, Zanesville, Ohio.

Device Simplifies Painting of Window Screens



A handy tool for home owners and anyone whose job requires the painting of window screens is the device shown above. Called the Jiffy screen painter and duster, the tool paints and cleans screens with a simple sweep of the wrist. Having a painting surface of 3"x5", the tool is made up of thousands of tiny hairs which not only cover the screen plane, but which reach down in and paint every part of the wire surface without clogging. In between paintings, it is ideal for dusting screen areas.

GASOLINE SAVING Device, 25c to $1.00. Ford, 1928-1942. Chevrolet, 1922-1942. Walert Co., 3129 N. 10th St., Milwaukee, Wis.

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ELECTRIC PENCIL: Writes—Engraves all Metals. $1.00 postpaid. Beyer Mfg., 4515-G Cottage Grove, Chicago.

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BUILD D.C. Arc-welder. Plans, Supplies, Welders Club, BB-3432 M-Mart, Chicago.

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INVENTORS:—HAVE you a useful, non-military invention for sale? Practical new ideas, patented or unpatented, urgently needed by manufacturers and consumers. Write for details. Chartered Institute of American Inventors, Dept. 5-B, Washington, D. C.

FREE BOOKLET "Why Invent" shows safe way to success. Facts no Fake! Don't attempt selling or patenting your invention before you have read it! Invention-Service Company, Dept.—C, Professional Arts Building, Hagerstown, Md.

SAVE MONEY, time, worry, before you patent! Market invention quick system $1.00. Inventor's Guide, 828, LaCrosse, Wis.

PATENTS: LOW cost. Book and advice free. L. F. Randolph, Dept. 311D, Washington, D. C.

CASH FOR practical ideas and inventions. Mr. Ball, FA-9411 Pleasant, Chicago.

GET YOUR own patents. Blanks, instructions $1. Cudding Sons, Campbell, Calif.

PATENTS

INVENTORS:—FORESIGHTED manufacturers already planning post-war sale of new non-military products. If you have a useful invention, patented or unpatented, write Chartered Institute of American Inventors, Dept. 5-A, Washington, D. C.

INVENTIONS PROMOTED. Patented or Unpatented. Write Adam Fisher Co., 582 Enright, St. Louis, Mo.

PATENT ATTORNEYS

INVENTIONS PROMOTED. Patented or Patent. Secure "Patent Guide" and "Record of Invention" form—Free. No charge for preliminary information. Write Clarence A. O'Brien and Harvey Jacobson, Registered Patent Attorneys, 23B-D Adams Building, Washington, D. C.

PATENTS, BOOKLET free. Highest references. Best results. Reasonable fees. Watson E. Coleman, Victor Building, Washington, D. C.

INVENTIONS WANTED

INVENTORS:—SMALL manufacturers need new inventions for altered civilian markets. If you have a practical, useful idea for sale, write Chartered Institute of American Inventors, Dept. 5-C, Washington, D. C.

INVENTORS: UNPATENTED inventions now salable with positive safeguards under patent laws. New, low-cost procedure. Complete details, free. American Patents Corporation, Dept. 11, Washington, D. C.

INTERESTED IN gadgets, inventions and defense items if suitable for national promotion. Patented or unpatented. Albert G. Burns, Alameda, Calif.

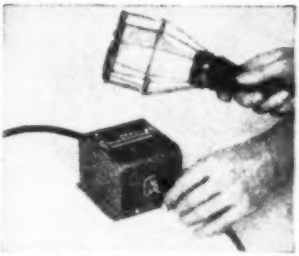
INVENTIONS PROMOTED. Patented or Unpatented. Write Adam Fisher Co., 582 Enright, St. Louis, Mo.

SELL YOUR patented, applied for, pending, invention quickly. Write: Universal, Box 772, Lancaster, Pa.

New Typewriter Resembles Linotype Machine

An improved kind of typewriter, not yet in process of manufacture, is said by its designer to embody several of the features now found in linotype machines. It will, for example, align both the left and right-hand margins—instead of just the left, as is done by the present typewriters in use. The machine will print an entire line of type at a time, spacing the lettering to fit the line and giving the typist time to proofread his work before it is transposed to the paper. In addition, the keys, resembling those of a piano, will facilitate the business of punching out typed matter.

Transformer Minimizes Danger of Severe Shock



Designed to step down voltage to prevent danger to workmen using electrical extensions in damp, all-metal or other hazardous locations, this new transformer is now on the market. The device reduces extension voltage to a harmless 6 volts, thus reducing the danger to workmen from shocks caused by bad sockets or defective extension cords. According to the manufacturer, the transformer is particularly recommended for inspection of maintenance work in damp, hazardous locations such as dairies, slaughter houses, boilers, breweries, laundries, ships, etc.

CASH FOR Inventions—patented or unpatented. Mr. Ball, FB-9411 Pleasant, Chicago, Ill.

WOULD YOU like steady income from unpatented ideas? Write Henderson, Argyle, Wis.

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TRAINS "O" catalog 25c. "HO" 10c. Walthers, 217 Erie, Milwaukee.

MODEL RAILROADING

MOST COMPLETE Illustrated Catalog "O-HO-OO" Model Railroad Parts & boats ever published. Send 5c for mailing. Selley, 1373 Gates Ave., Dept. 905, Brooklyn, N. Y.

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FOR SPARE Time Profits Assemble and sell Dillabaugh Plywood Rowboats. I furnish material, parts, instructions. Write today for moneymaking proposition. C. R. Dillabaugh, 7009 Mallory, Portland, Ore.

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MAIL $1.00 MONEY Order for Beautiful Lawn Seat Plans. Complete. Full Size. Basil M. Reed, 119 Albemarle Ave., SW., Roanoke, Va.

ANTIQUES, INDIAN Relics, Antique Firearms, Swords, Minerals, Catalogue 10c (Most Photographed). Heidke, Rutland, Ill.

VENETIAN BLINDS at wholesale. Repairs, Tapes, Cords, etc. List Free. Altmeyer, 412 10th Street, New Kensington, Pa.

1000 TELUHOW PLANS tell Homeworkers about building 1000 projects. List 10c. C. King, E. Kingston, N. H.

BUILD-IT-YOURSELF

BUILD YOUR tractor from second-hand automobiles! Convert your horse drawn farm equipment into tractor drawn equipment. Nolan's Garage, East Wareham, Mass.

BUILD ARC-WELDER. Costs 25c, using Electric Toaster. Directions 25c. Essay Mfg. Co., 47 Littlefield St., Hough's Neck, Quincy, Mass.

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ENJOY ALL the thrills of fishing and sailing in your own beautiful 18-ft. Cabin Auxiliary Sloop. Easy to build if you follow instructions. Complete plans, diagrams and instructions, only 25c. Specify Booklet 1. Write today to How-To-Build-It Editor, Fawcett Publications, Inc., Fawcett Bldg., Greenwich, Conn.

OUTBOARD MOTORS—used and rebuilt bargains, list free. Used parts, save money. Crandall-Hicks Co., 953 Commonwealth, Boston, Mass.

KAYAKS, OUTBOARDS, Rowboats, Duckboats. Construction Kits. '42 Models. Dime for Catalogs. Cre-Craft Boats, Millburn, New Jersey.

MARINE CONVERSION Parts for all auto engines. Buy here and save. Conversion Parts Co., 279 Adams St., Boston, Mass.

FORD AND Zephyr marine conversions. 10c coin. Lehman Engineering Company, Dept. C, Newark, N. J.

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GREAT DANE Pups on approval. Time Payments. Kalmar—Danary, Stone Mountain, Ga.

FIELDGLASSES, TELESCOPES, MICROSCOPES, ETC.

TELESCOPES, MICROSCOPES, Binoculars: bargain catalog free. Brownscope Company, 125 West 45th Street, New York.

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SPECTROSCOPE for quick chemical analysis $2.50. Cudding Sons, Campbell, Calif.

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40 ACRES NEAR White River, unimproved poultry land. $190; $5 down, $5 monthly. Free list and literature. Hubbard, 224 Grossman Bldg., Kansas City, Kan.

FREE LITERATURE on the beautiful Ozarks and $5 acre lands there. Write Barnsley, Ozone, Ark.

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WIN PRIZE Money: Booklet—"Successful Contesting" Shows how. 10c postpaid. Bulletin listing $100,000.00 prizes included. World Publishing, 4515-K Cottage Grove, Chicago.

CONTESTANTS! PUZZLERS! See our ad under "Miscellaneous." Anglo-American Research, Los Angeles.

CONQUER ILLEGAL Slot Machines! Particulars, 3c stamp. Devereaux, Box 212-F, Battle Creek, Mich.

MEXICAN LEGAL Matters. Wm. Cocke, Reliable American Attorney, El Paso, Texas.

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CURRENT COPIES Business-Trade-Vocational-Diversion Magazines. Choice 350 different publications—over 100 callings. Free price list. Commercial Engraving Publishing Company, 21W North Ritter, Indianapolis, Ind.

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ARTISTIC PHOTOGRAPHS. List, sample, dime. Parisette, 22 Nunn Building, Rochester, N. Y.

WATCHES, WATCHMAKING, ETC.

WATCHMAKERS' MATERIALS. Tools, Jewelry—bought, sold. Best prices for Old Gold, Diamonds. Free Catalog. Ben Segal Company, Box 150, Chicago.

ELGIN, WALTHAM Watches $3.50. Make big money. Free watch and jewelry catalog. Plymouth Jewelry Co., 163-C Canal St., N. Y.

JEWELRY

BEAUTIFUL STONES removed from rings, etc. 200 assorted $2.00. Lowe's, Box 311, St. Louis, Mo.

MISCELLANEOUS

CONTESTANTS! PUZZLERS! Don't let your lack of a specified dictionary prevent you from winning score-building contests. Send name on postal card for complete particulars. Anglo-American Research, Box 44, Los Angeles, Calif.

RECEIVE GIGANTIC mails, magazines, samples. Your name in numerous mailing lists 10c. Howard, 396 Broadway, New York.

ANTIQUES, INDIAN Relics, Antique Firearms, Minerals—Catalogue 10c (Most Photographed). Heltke, Rutland, Ill.

LUMINOUS PAINT shines in dark 35c ½ oz. prepaid. Thomas Cannata, 308 Springfield St., Belmont, Mass.

MORE BUYERS for your money. Write to Bill Corvell, 23rd Floor, 1501 Broadway, New York City.

BURIED TREASURE, Minerals, free booklet, photographs. Fisher Laboratory, Palo Alto, Calif.

LUMINOUS PIGMENT lacquer flowers. Samples, $1.00. Lumina, 16 W. 21, New York City.

OVER 1001 ITEMS. Wonderful Bargain Catalog. Varanow, 313 E. 23 St., N. Y. C.

HEATING SIX rooms $20 yearly. Information 10c. Rosenzweig, Route 10K5, Cincinnati.

Letters To The Editor

[*Continued from page 25*]

To the Editor:

It certainly was nice to have my pet project appear in MECHANIX ILLUSTRATED as a winner of a Workbench award. Many thanks to you for the nice write-up, and also for the check.

I have been buying MI since 1936—which is proof that I think it is the best magazine in its class, even if it does cost only ten cents.

I like best the how-to-build and how-to-do articles and I have a few more projects I want to enter in the near future to win a Certificate of Merit. At present I am working on a drill press, and some optical work.

H. Gebelein
Davenport, Iowa

* * *

To the Editor:

We are wholesale and retail jobbers on the Pacific Coast for Vitamin products.

If it is at all possible we would like to have your permission to reprint the article published in your December issue of MECHANIX ILLUSTRATED entitled "Captain Marvel Troops for America."

We want to reprint this in pamphlet form in whole or in part to distribute among our customers, and any cooperation you may give us will be beneficial to us both.

Floyd Donaldson, Sales Manager
Vitamin Factors Company
Oakland, California

* * *

To the Editor:

I just received your check for $5 and the announcement that I won the fifth prize in your recent Cigar Box Contest.

I want to express my thanks to you and the judges for considering my entry and awarding me a prize.

John Cordas, Jr.
Barberton, Ohio

To the Editor:

I read "You're Wanted—For a Defense Job" in the July issue of MI, and would like to get one of those jobs but, as I live in Canada, I have no way of getting in touch with them.

I am a mechanic, can operate several different machines, and have built several houses and trailers.

If you have any addresses in any part of the country at all I would like to have them. I was born in the United States and have papers to show that I can come to the U. S. at any time.

Ed A. Himmelepack
Estevan, Sask., Canada

Mr. Himmelepack will have to write to the War Production Board, Washington, D. C., for any information. They keep an up-to-date record of the needs of all defense industries in regard to jobs, and should be able to be of assistance.

* * *

To the Editor:

I was no end pleased when I discovered you had started a column on Cryptorithms, as I am always interested in problems of this type. Your able exposition on how to solve the problems made it possible for me to determine the answers to the first two with no trouble at all.

Even though the main reason I buy your magazine is for these Cryptorithms, it contains many things a trained man can use in his daily work. Keep it this way and I'm sure all your new readers will become permanent ones.

The American Cryptogram Association

E. E. Alden
189 Montcalm Drive
Rochester, New York

[*Continued on page 33*]

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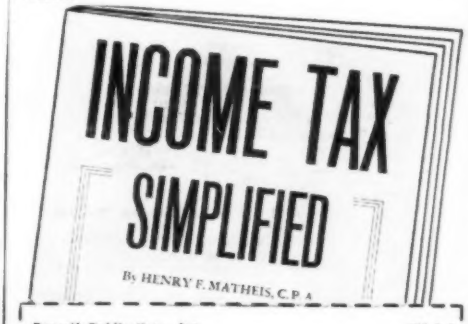

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Letters To The Editor

[*Continued from page 31*]

o the Editor:

I would appreciate it greatly if you could present my roblem to the readers of MECHANIX ILLUSTRATED, as I elieve they can offer me good suggestions, if not a ractical solution.

I can't walk because of chronic infantile paralysis. I ould like to make or buy a small motor-driven vehicle f some kind that would enable me to get around, both ndoors and outdoors. I considered a motor scooter but he main difficulty is in the starting of the motor. It equires either a kick starter or pushing the scooter a ew steps and I do not have the strength in my legs to o either of these. A self-starter device would be the nly remedy for this.

If I can't find a small motor-driven vehicle already eing manufactured at small cost, I will have to make ne. I am a little bit mechanically inclined and have a ew ideas on construction. Again the problem is finding gas engine that could be equipped with a self starter. A possibility I had in mind was a motor powered by batteries. This would be very practical, for all I'd have o do to start the motor would be to turn on the switch. However, I don't know much about this subject and wondered if any MI readers could explain, with illustrations, how to make an electric motor run by batteries. This would solve my main problem; I have plenty of time to work out construction details of the body.

If any reader thinks he can help me make such a vehicle, or knows where I can buy one inexpensively I would appreciate having him contact me. Here are the specifications:

Weight—I weigh less than 100 lbs. The motor would have to be able to pull my weight, plus that of the carriage and motor.

Speed—High speed is not essential. Four or five miles per hour is fast enough for me. If possible, include reverse speed or switch.

Length—Not more than four or five feet.

Width—Not more than twenty-four inches.

Height—Not more than twenty-six inches (height of seat from ground). It is essential that the vehicle be as small as possible so I can use it indoors as well as outdoors, and so I can move it in and out easily.

Please do the best you can, and thank you for your time.

Mikey Leonard
515 Tenth Street, S.E.
Canton, Ohio

* * *

To the Editor:

Your quiz page "You're Right—That's Wrong" has always proved to be not only an interesting but an informative feature of MECHANIX ILLUSTRATED in our home. In this busy day we have such little time to ferret out the answers to the millions of questions we would like to know. This page solves the problem.

My husband and I have been saving questions for several weeks and when we have enough we are going to pick out some of the best ones and submit them to your page. We hope a few of them will merit publication.

The "Crafts and Hobbies" section of MI also provides many helpful hints for garden and outdoor decorations. We have put a great many ideas to use. You have our wish that your magazine continues to be as much of a service to us as it has been in the past.

Mrs. C. A. Reese
2334 25th Avenue South
St. Petersburg, Florida

* * *

To the Editor:

Last year a friend of mine told me about the unusual contest you were running in your magazine, and as I am interested in contests, I immediately purchased a copy. I enjoyed this contest immensely and have been watching your issues to be sure to get in on the next one.

After buying my first edition, and giving it a thorough inspection, I was amazed at the wealth of general information included in a magazine that sells for only ten cents. I had been in the habit of buying more expensive magazines of this type but have given up this practice because none have given me more for my money than MECHANIX ILLUSTRATED. Proof of this was my order for a year's subscription.

John J. Dwyer
368 Maole Ave
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Its decks littered with wreckage caused by depth bombs, the Italian submarine, "Galilei" flies British flag in surrender.

This Is The SUB'S LAST WAR!

MAR 1 3 194
RECEIVE

Caught on the surface by a corvette, the crew of a submarine goes into desperate action, attempting to defend themselves.

The secret story of submarine failure, hidden by Nazi censorship until now, is revealed for the first time.

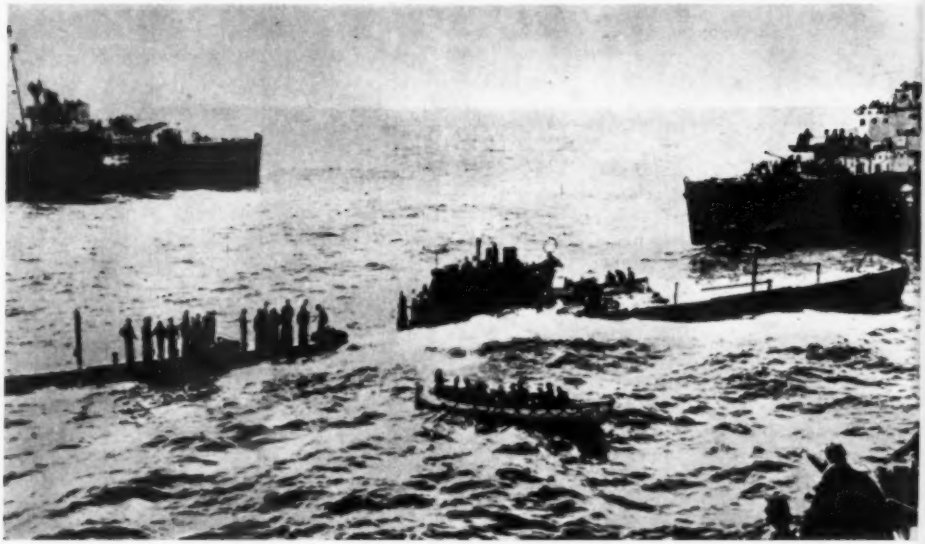
by Howard Hartshorn

IS THE submarine on its way out?

A strange question to raise, you may say, at a time when this deadly destroyer of the deep is terrorizing traffic on the Atlantic and threatening to smash the economic and military strength of the British Empire. Yet there are signs that the U-Boat may be swept into the discard by the hand of Mars—not today, nor tomorrow, perhaps, but within the next few years.

Oblivion is the fate of every weapon of war that fails to keep pace with the development of defensive measures against it. The submarine is solely a war weapon with no established excuse for being in peace-time. And its enemies—the active and inventive gentlemen who devise naval strategy and design naval weapons—have been making real progress of late. Not long ago a significant little news dispatch slipped out of Berlin past the censor's guard. In it a German submarine commander was quoted as saying that he was finding it "harder and harder" to operate successfully in the shipping zones. He did not elaborate on his reasons, but his tell-tale admission was followed soon after by an official Berlin announcement that only 252,000 tons of British shipping had been sunk by U-Boats in one month against 452,000 tons in the previous month. The submarine's toll, in fact, was not vastly greater than that compiled during the same period by surface craft (18,000 tons) and airplanes (168,000 tons).

The German High Command's estimates of British shipping losses are, of course, much higher than those issued by the British Ad-



Spotted by secret radiolocators, the Indian sub shown in this dramatic photo found itself fatally surrounded by destroyers.

miralty, but the story told by both sources is the same as far as the submarine is concerned. For in its latest published figures, the Admiralty at London claimed that the U-Boat's depradations have recently been reduced not merely by half—as the Germans admit—but by two-thirds!

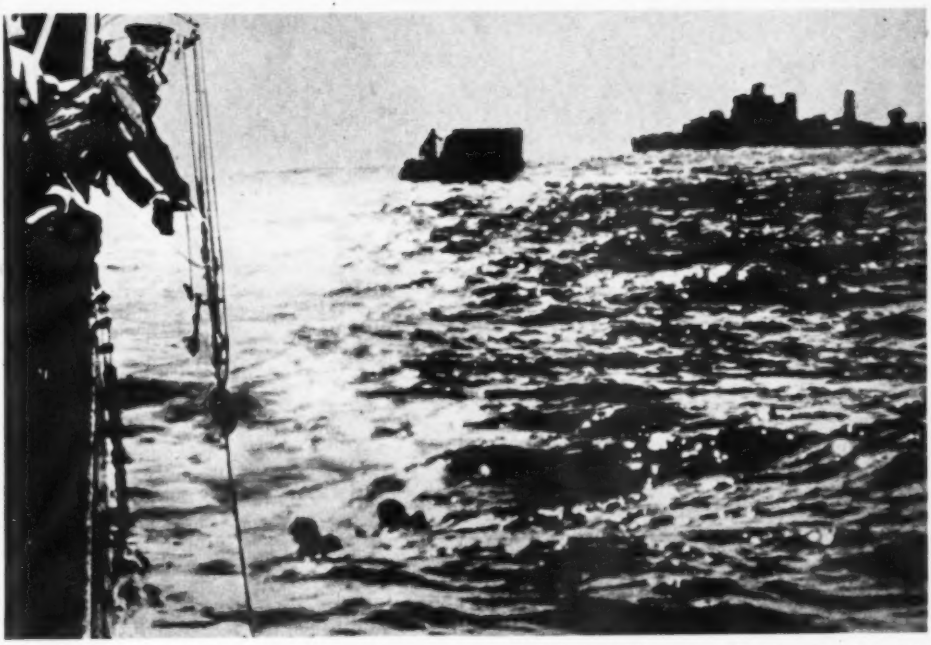
Granted, the statistics of a single month are not all-conclusive. Quite possibly the Nazi undersea fleet had simply been lying doggo for a time, refueling and rearming for a fresh sortie into the sea lanes, more devastating than any on record. But don't bet on it. Some big factors have lately been thrown into the balance against it.

First of these factors is the United States Navy. Except for a few over-age vessels like the *Reuben James,* our battle fleet is the most modern and best-equipped in the world. True, the torpedoing of American Naval and merchant vessels may be headlined in the newspapers until the public begins to fear that our freedom of the seas is lost. But all the while, our Navy will be quietly dealing one knock-out blow after another to the undersea marauders, sinking them by the score.

There won't be any boasting about it beforehand; the Navy doesn't operate that way. But even now U. S. Naval officers will tell you, off the record, that the Germans have had to pay a terrific price for every torpedo that hit its mark in the hull of an American ship. In fact, some experts believe that a submarine's chances of even getting close to a convoy have been cut in two by the sheer numerical addition of our Naval strength to that of Great Britain.

Plus this, American Naval strategists are a resourceful lot and they have some new tricks up their sleeves. As a matter of fact, American experts are generally credited with having originated the convoy plan itself, during the World War. This was a crucial turning point that had much to do with the Kaiser's defeat. Today U. S. Naval officials have devised a new and perhaps equally vital plan. This involves equipping made-over merchant vessels with airplane landing decks. These makeshift aircraft carriers, one to a convoy, will not only provide a defense against attack from the air but will enable the protectors to strike at submarines from above. British, Canadian, and U. S. air patrols have already made the areas along shore fairly safe for convoys despite the fact that occasional U-Boats have been prowling off the coast of the U. S. With the addition of air protection, the merchant fleets will have a chance they have never had before to defend themselves far out at sea in what has previously been their most vulnerable zone.

A second significant factor is the development by British chemists of a new high explosive depth charge reported to be *nearly 50 times as powerful as TNT.* So much greater



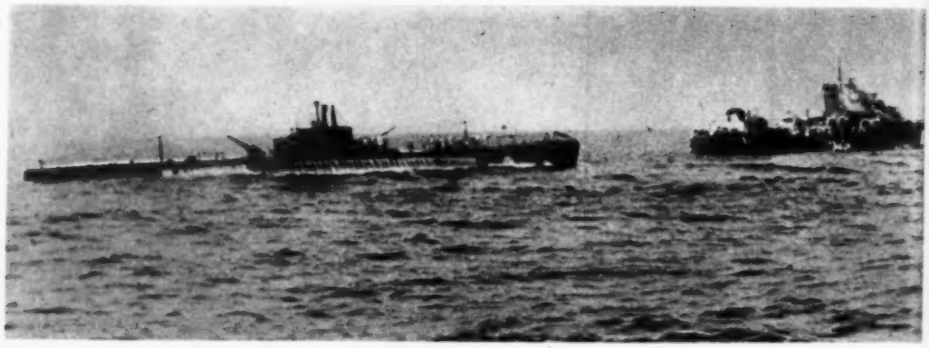
Brought to the surface by the new British depth charge, the crew of this enemy sub swam to safety (note men in water).

is the area in which the detonation of this explosive acts with crushing force that it cannot be dropped safely from the deck of a warship traveling at a speed of 25 knots lest it destroy the ship itself! Instead it is fired from a small deck cannon; and woe betide the submarine that happens to be anywhere near it when it hits the water and explodes!

The new explosive is encased in a thin container much smaller than the conventional "ash can" depth charge with its 200 pound load of TNT. The container can also be equipped with a secret propelling device and used as a vertical torpedo. Small wonder that news reports, filtering in from neutral countries, indicate that the morale of German submarine crews has fallen off badly in recent months to such a degree that mutinies—like those that occurred in the closing months of the World War—are feared.

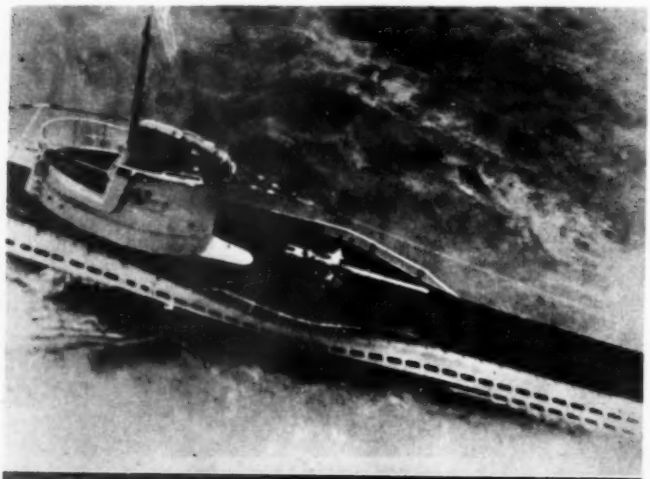
Incidentally, the lowering of German morale is one of the key objectives of the

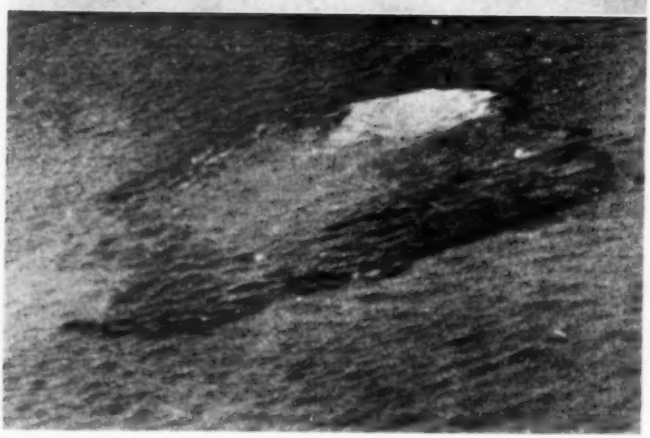
Here's what new depth charges do! Black smoke pours from Nazi sub.



Blown to the surface in the Mediterranean, the crew of this enemy raider rushes to deck to surrender. Note split seam.

British-American counter-attack on the submarine. The authority for this statement is our own Secretary of the Navy, Frank Knox, who has announced that the U. S. Navy has joined forces with the British in a "war of nerves" against the U-Boat commanders and crews. He pointed out that the Admiralty has rarely announced the sinkings of submarines, preferring to keep them "shrouded in mystery" so that, borne on the winds of rumor and gossip, they would seem ever more fearsome to the Germans on the home front.





Knox disclosed that until further notice the Navy would make a policy of keeping silent on submarine sinkings.

"Britain has been in the war a long time now and has been combating the German submarine forces and you haven't read much about submarines being sunk by the British, have you—but there were a lot," the Secretary declared. He then depicted the lowered spirits of German U-Boat crews watching other crews "when they go out and just don't come back."

Soon thereafter, the British did make one of their few exceptions to their rule of silence when they announced that, since the start of the war, *one-third* of Italy's large [*Continued on page* 156]

A British plane sends a sub to the bottom. Pictures taken from plane.

Two Million Kilowatts Run Wild

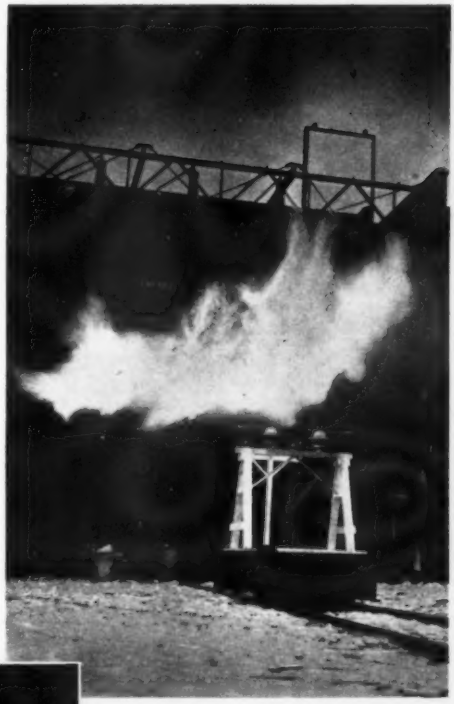
ELECTRICAL knockout blows of 2,000,000 kilowatts, equal to twice the power generated at any instant at Niagara Falls, were delivered and rendered harmless by improved protective devices, at the first public demonstration of Westinghouse's new super-power testing laboratory, most powerful of its kind in the world.

In demonstrations before Army and Navy officers, these knockout blows duplicated the effects of a short circuit such as could be caused by a bar of steel thrown across the electric circuits in a power station by a saboteur, the severance of a power line so that it would fall to the ground, explosives planted on the ground, or an aerial bomb.

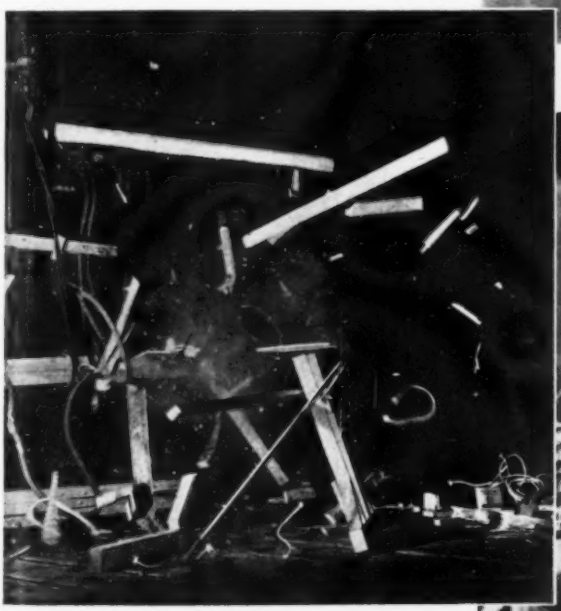
The torrent of power suddenly released produced flaming arcs 20 feet in length, exploded old-time safety fuses with detonations as loud as shellfire, and shattered six-inch timbers into kindling wood.

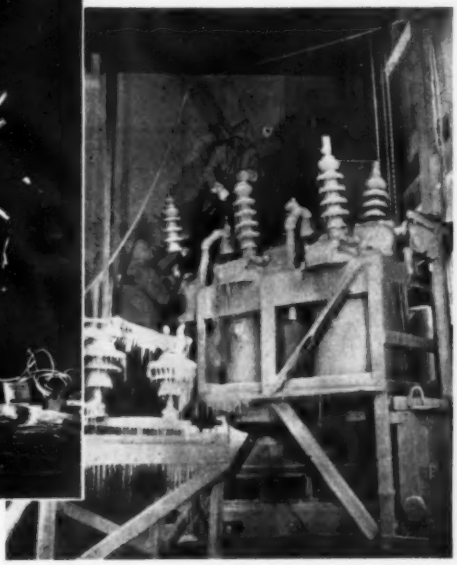
But a new 12-foot-tall improved oil circuit-breaker snuffed out the arc in a twentieth of a second and by-passed the current into a chamber where it was choked off with magnetic plates. Applied to a power line, the

[*Continued on page* 162]



2,000,000 kilowatts roar in an uncontrolled arc 20 feet long, in this Westinghouse test.





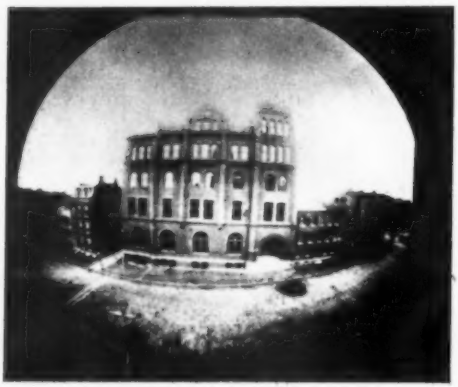
Six-inch timbers are shattered (above) as the tremendous electrical force blasts through cables run between them. Right, 20 below weather is created to test power switches.

PROFESSOR WOOD--

Eminent Screwball Of The Laboratory

by William Seabrook

Professor Robert W. Wood, of Johns Hopkins. His exploits have won him the acclaim of scientists and the raised eyebrows of quieter colleagues shocked by his impish humor.



Wondering what the world looks like to a fish, Professor Wood devised a "fish-eye" camera and took this picture! To fish, not only is the world round, but everything else.

THAT science can be more fun than a three-ring circus and that a great scientist can be as *funny* as any famous Hollywood comedian, is an idea which may be new to a lot of readers—and also to a lot of prim old-fashioned teachers and professors.

The world-renowned scientist who has proven this up to the hilt and to the sometimes shocked amazement of his stodgier colleagues, is none other than Robert W. Wood, head of the Research Department in Physics at Johns Hopkins University.

He has been outstandingly famous throughout his whole life for having fun—for mixing brilliant and outrageous pranks with experiments, researches, majestic discoveries which have helped revolutionize our modern concept of the universe while at the same time making our own now-tortured planet a more tolerable and amusing place to live on.

The Royal Society of London, the highest tribunal of Science, gave its most prized award, The Rumford Medal, to Dr. Wood and proclaimed that the American scientist had made the basic discoveries on which the modern material theory of our universe is founded. And yet Dr. Wood is more famed in scientific circles as the playboy who made a Yellowstone Park geyser turn green!

Yet in outward appearance, garb and manners, he is the antithesis of anything boisterous or eccentric. Tall, well groomed, athletic and ruddy cheeked despite his 70 odd years; blue eyed, with a strong classic profile and a good crop of well-kempt iron-gray hair; with an accent and manner that stamp him as top-notch prosperous New England—you would never guess that behind this cultured and formidable "front" there lurks grinning and always ready to thumb his nose at all creation, a Katzenjammer Kid who has never grown up.

In habits and mode of life—except for the enormous amount of work he manages to get done—he is also the antithesis of everything

A famous author tells you what happens when science and a sense of humor are combined!

An early picture of Prof. Wood, showing him, above, at work on his mercury telescope. His reflection in the mercury can be seen at the bottom. Flying was his hobby, left, when he took this shot of Otto Lilienthal, pioneer glider.

you generally associate with the learned laboratory worker or professor. Addicted to gay parties, with hosts of friends and a gay family, a handsome brownstone mansion in Baltimore and a summer estate at fashionable East Hampton on Long Island, he plays even harder than he works, keeps the guests always in an uproar and his amazingly tolerant wife in a state of continual apprehension.

Yet it is rather in connection with his serious, epoch-making labors and discoveries that his most outrageous comedies are perpetrated.

When one summer in the old cow barn at East Hampton he built the world's largest spectroscope (which led eventually to the improved diffraction gratings installed today in most of the world's great astronomical observatories where they catch the light from farthest starry galaxies), a lot of spiders got into its 40-foot, bent, homemade wooden tube and wove their webs there. Wondering how he'd get a mop through, Wood's gay, roving eyes fell on the large, yellow, family cat. "Here pussy," he called and when pussy came he stuffed her in one end of the dark tube, clapped it shut and banged upon it as the savage does his voodoo jungle drum. Pussy lit out and emerged with record speed from the other end of the long tube to flee yowling, dragging trails of spider web which resembled Ophelia's bridal veil—after Ophelia had gone mad!

One result of that spontaneous escapade is that the wretched cat is almost as famous in sober scientific circles as the spectroscope!

When this "bad-boy"-genius-who-never-grew-up began the experiments leading to the powerful and complicated sodium vapor lamps which now light big bridges, skyways, modern highways, one of the first simple things he learned was that a lump of metallic

A 1911 photo made by Wood of a summer scene in Sicily. This is the earliest landscape photograph, using infrared light, ever made. The professor also made ultraviolet ray discoveries which led to a beacon lamp safeguarding convoys.

sodium thrown into any pool or puddle would catch fire on contact with the water and spread on its surface in a terrific, flashing, yellow blaze. Next day he panicked a group of negroes near the Johns Hopkins campus by ostentatiously spitting into a pool, at the same time surreptitiously tossing in a ball of sodium. When the pool flamed, pandemonium broke loose, howls, prayers, flight, with one voice louder than the rest.

"Out o' my way, niggers! Dat man *spit* fire! He look young—but only old Satan hisself can do dat!"

When our sometimes-really-satanic imp of the great laboratories was making the discoveries with ultraviolet rays which resulted in the beacon-lamp enabling war convoys to maintain formation at night while remaining invisible to the periscopes of submarines, the Encyclopedia Britannica invited him to do an article about it, with photographs showing how ultraviolet light converted black to white and vice versa. This time his eye fell on no pussy-cat but on a pretty "platinum blonde" who sat at one of the university's reception desks.

"How'd you like to have your picture in the Encyclopedia, my dear?" he asked. And when his fair victim consented, he photographed her. The portrait now appears in the great tome (you can see it yourself if you have a Britannica handy) but the fair lady is inky black, with teeth and eyeballs gleaming like those of a terrified mule from the shaft of a coal-mine . . .

Not even Wood's beautiful and dignified young bride was immune from his pranks on their honeymoon. This time his most memorable joke was innocent but colossal. One of the chemicals then interesting him was fluorescein, a speck of which the size of a pinhead when dissolved in a big barrel of water will cause the water to turn a luminous brilliant emerald green. "If one pinhead speck will do that," said Wood to himself, "what will a whole bottle of it do dumped into a Yellowstone Park geyser!" They were headed toward Yellowstone anyway, and Wood gleefully recalled that one of the spouting springs was called the Emerald. When he took his bride to see that spring he chose a moment when she and the guards were not watching, and emptied his bottle in it. The result, I'm told, was beautiful—and appalling. For once in its history, that mighty Emerald spring was really green! A thunderhead of dazzling color still remembered by tourists and guides with awe, as if they'd seen a miracle.

"I was fed up," explained Wood, "with the nature - worship and nature - faking then rampant, and thought it would be fun to improve, as it were, on nature."

A little later he got so sick of the elaborate rhapsodies written in those days by mushy, popular pseudo-scientific writers on botany and ornithology that he sat down and wrote in rhyme a book of comic satire happily

entitled *How To Tell the Birds From the Flowers.* It was really funny, delighted children and grownups alike . . . has run into 19 editions, and is still going strong.

But it's not always so easy to tell whether Wood is poking fun or not. One of his world-famous scientific triumphs relieved by a touch of comedy at the end, was solving the mystery of the purple gold ornaments found in King Tutankhamen's tomb. He and Mrs. Wood were in Cairo when the mystery was at its height. Royal Society archeologists, chemists, goldsmiths, the British Museum, had subjected the purple gold to every conceivable test—and drawn a blank. Wood obtained the loan of some small ornaments, and was duplicating the purple gold in no time—in his own laboratories. When disgruntled British scientists asked him how, he said,

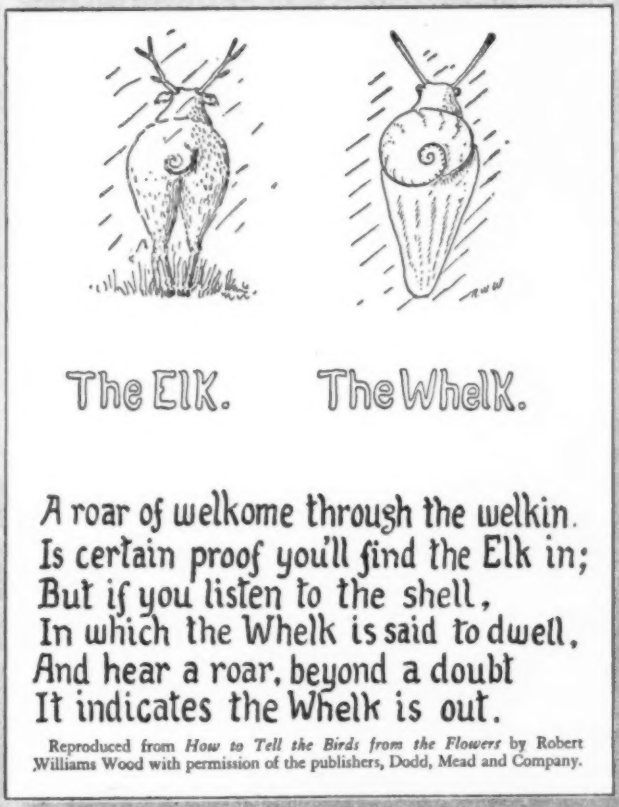
"Oh, I had an inspiration. I did it with my wife's fingernail polish!"

They don't know yet whether that part of it was a joke or not.

And on top of it the whole British Admiralty is still wondering whether this great American scientist was spoofing when he talked them into training seals in the First World War to track down German submarines! Wood argued as a major in the signal corps, and in all seeming seriousness, that since foxhounds could be taught to follow a bag of anise seed on land, seals could be taught to follow the odor from submarine oil and exhausts in the water! How were you going to follow the seals? A collar with a fine steel wire attached to a large, hollow ball painted scarlet and

[*Continued on page 178*]

Professor Wood testing his "flash telescope," which he made from a stovepipe!


The Elk.
The Whelk.
A roar of welkome through the welkin.
Is certain proof you'll find the Elk in;
But if you listen to the shell,
In which the Whelk is said to dwell,
And hear a roar, beyond a doubt
It indicates the Whelk is out.

Reproduced from *How to Tell the Birds from the Flowers* by Robert Williams Wood with permission of the publishers, Dodd, Mead and Company.

So you still don't believe he's a screwball? Then read the above, a page from his hilarious book, "How to Tell the Birds From the Flowers."

FIVE DOLLAR FORTUNE

Every new type of propeller must be carefully tested for perfect performance. This specialist in the research department watches the dial pointer as it mounts during one of the many tests. Every day new model designs are tried by these men.

Designer Carl Goldberg examines the work of a young admirer. These two gas-powered models have the wings set high above the thrust line to climb steeply to maximum height while under power. Wings are mounted on small pylon rising from top of fuselage, and have pronounced tip dihedral. Two inner spars strengthen the wing.

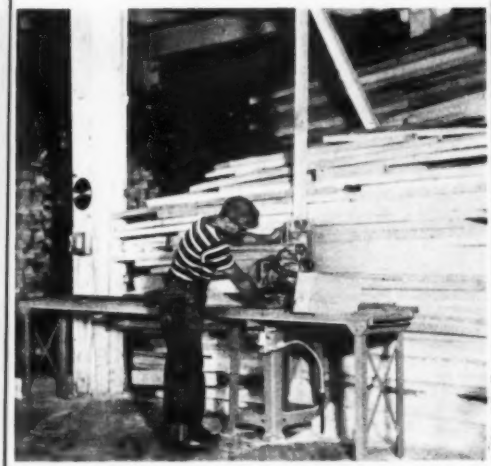
BUILDING a man-carrying glider from a back fence and a pile of fruit boxes is a neat trick even if you don't do it. Back in 1929, young William Bibichkow and Sam Goldenberg decided to try it, so they made and sold some model airplane supplies to finance the project. They had tried turning out little radios made from cigar boxes, but those hadn't sold very well. Neither had their little ship models.

Being members of Chicago's Crane Technical High School Aero Club, they knew their model planes. It was after school on a snappy October day that they handled their first 43 cents worth of model airplane business, with some of their schoolmates as customers. Those two enterprising kids never dreamed that in a few years they'd have a corporation turning out ten million model kits a year, but they have!

Bill Bibichkow, whose father's back fence was to be used in the glider, is now the Comet Model Airplane & Supply Company's designer, and Sam Goldenberg—who provided the wood for those original after-school model. little profit was starting to show, their supplies, is in charge of sales.

It wasn't all as easy as it sounds, however. In the beginning, just when a

Three boys and a tall story started it—
Now they make 10,000,000 models a year!



Worker in mill department above cuts balsa wood to size from giant storage pile in background. That'll make plenty of models. At the right Goldberg adjusts one of the super gas jobs before a flight. Note the large area of the wing and tail surfaces.

Above: Left to right, Louis Kapp, Sam Goldenberg, and Bill Bibichkow, who made a fortune from $3 and a good idea. Right: Corner of room where millions of kits are packed.

lack of machine tools called for a major cash outlay. Young Mr. Bibichkow spent $3 for a circular saw which was then installed in the workshop behind his father's tailor shop. Sam provided the rest of their initial $5 capital in the form of lumber. More money had to be spent for printing the price lists and for a little sign to advertise their wares.

The boys began to feel like real executives. Their enthusiasm mounted and they began to talk in big figures—just for fun at first. They talked like that to a laundry worker named Louis Kapp, who stopped in one day to see the workshop. With a humorous gleam in their eyes they told the amazed Mr. Kapp of thousands of orders from department

[*Continued on page* 153]

HOW GOOD

The "bugs" in America's military equipment are pointed out frankly in this authoritative article.

by Major Malcolm Wheeler-Nicholson

Famous Military Expert

All of the material published in this article has appeared from time to time in various journals and no secret data is revealed herewith.

Forward-firing, 75 mm. U. S. tank destroyer: "It is highly questionable whether it could stand the stress of firing under combat conditions," Major Wheeler-Nicholson says. Note its flimsy, wide-open armor plate.

THE offense wins in war today. On land, the offense now depends almost entirely upon applied mechanics. Being a "nation of mechanics," America can look forward confidently to winning the war eventually. But just how good are America's mechanized striking forces at present?

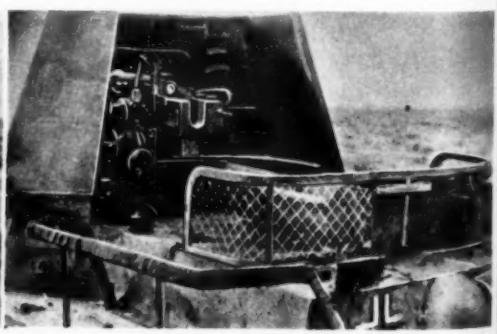
How effective, mechanically, are our anti-tank weapons, anti-aircraft weapons, our light, medium and heavy tanks?

This is probably the most important question in America today—for victory or defeat for America depends primarily upon the efficiency of its offensive war machines.

To understand clearly the importance of offensive weapons in this war, let us consider for a moment the revolution which has occurred in warfare. In World War I, the machine gun and barbed wire gave all the advantage to

Above, a jeep-mounted 37 mm. tank destroyer. The author says it is a "pop gun" and points out it is slow because the crew must dismount to fire. Compare with Nazi gun below.

Two photos below show Nazi tank destroyer. Note armor protection, guns mounted forward for instant firing, wide traverse. Author says they will outfight U. S. tank destroyers.



ARE OUR WAR MACHINES?

Great majority of U. S. tanks are like the light tank shown above. Major Wheeler-Nicholson points out the gunner, to man the anti-aircraft gun, must emerge from the turret and fire with little or no protection against airplane machine gun strafing.

the defending armies. Machine guns and barbed wire kept millions of men huddled in trenches for four long years. Because of them, the offensive was too costly in men and material.

The plane and the tank were the weapons that broke the stalemate of war, as everyone knows now. Because of new techniques applied to the plane and the tank, the advantage today has shifted over entirely to the offense. It was the British who actually invented the blueprint for the blitzkrieg. In the last few months of World War I, the British tank corps demonstrated what could be done with a war of armored movement. They failed to recognize their own discovery, however, and it remained for the German general staff to apply these lessons. Smarting under bitter defeat, the Germans heeded the experiments and recommendations of the far sighted officers in the armies of Great Britain, France and America, who strongly advocated stress on mechanized warfare for the future. As a consequence, the anti-Axis armies were far behind the Nazi forces in mechanization. Our army in fact was behind the British and French armies in 1939, possessing

Medium tanks (above) have a major fault, the author says. The 75 mm. gun is mounted at the tank's side, with only a 30 degree traverse, leaving a large "blind spot." This is being corrected in new tanks.

M-1 heavy tank (right) is America's pride. Equipped with a 105 mm. main gun, it will be faster, better armored and more lethal than the Nazis' tanks.

only some 18 modern or near modern tanks! Our tanks manned by British Empire personnel have already been in action against the Nazi tanks in Libya. These consisted principally of our light tanks which seem to have given satisfaction after ironing out a few "bugs" reported to have developed on active service.

These "bugs" probably included the main weapon of these light tanks, a 37 mm. gun modeled on the German Rhein-Metall model of 1938, which has been discarded by other armies in favor of harder hitting, longer range and more deeply penetrative tank cannon. A newer model undoubtedly has been adopted in our own army by now.

Our light tanks are probably as fast or faster than anything the Germans possess—and this implies a certain sacrifice of hitting and armored defensive power. Equivalent light models in the German service are armored with 1½ inches of steel on the front and 1¼ inches on the sides; they carry 40 mm. guns capable of penetrating 1½ inches of armor plate at 900 meters.

Another "bug" in this light tank of ours was the dependence upon a separate light caliber anti-aircraft gun requiring separate operation by a gunner who had to operate the gun without protection from hostile fire. The tendency in our army by now is undoubtedly to follow the German practice of combining the functions of anti-aircraft and anti-tank fire in one gun having both horizontal and vertical traverse with adequate armored protection for the gunners.

In assessing the praise given our light tanks in Libya, we must take into consideration the fact that the difficulties of sea transportation probably prevented the Germans from using any of their heavier tanks in North Africa. It is doubtful, then, that Libya was any real test of our equipment. Libya *did* prove that our light tanks are speedy and that their

Until tank destroyers are perfected, the U. S. army is depending on old-style field guns for tank defense. This series of pictures shows the various steps necessary to get a gun into action. Above, crew dismounts: Step No. 1.

At right, after unlimbering the field gun from its truck, the gun must be set up by its crew. A minimum crew of five men is required for this procedure and from one to four minutes is necessary for them to set up the gun.

motors are superb—and, also, it did enable us to spot the tank's weaknesses, which undoubtedly have been corrected by this time.

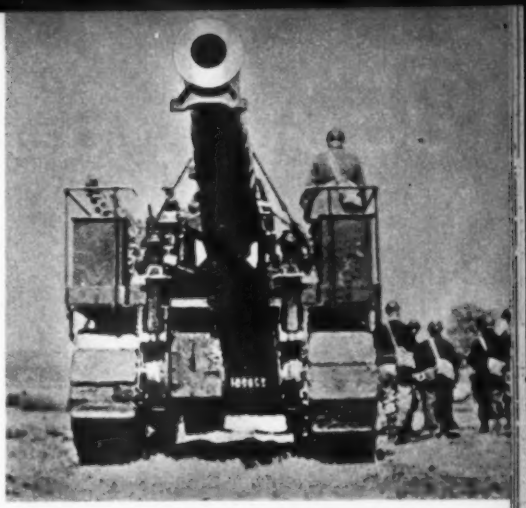
One of the chief weaknesses, other than those already mentioned, which was shown up in the African campaign was the use of rivets in our tanks. It was discovered that when one of these riveted tanks received a shell hit, the rivets broke loose and sprayed about inside the tanks, killing or wounding the crew. This was corrected by developing cast-steel bodies and welding the sections together.

Our medium tanks were found to have a number of "bugs," one of which was serious. The principal criticisms of the medium tank, as first developed, were:

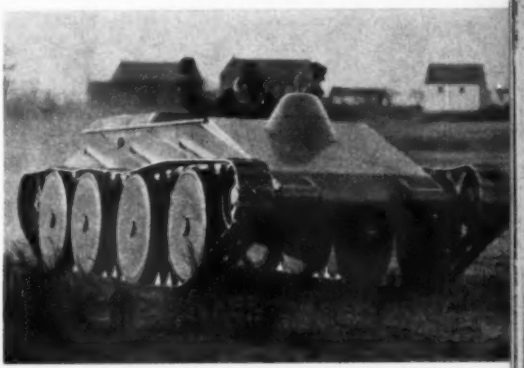
1. Its main gun was awkwardly placed at the right side of the tank in such a manner that it only had movement in a 30 degree angle. This left great "blind spots" in the tank, in which the gun could not be fired. This is being corrected by placing the gun in a turret atop the tank.

2. Dependence upon a 75 mm. gun as main armament. German tanks of equivalent size mount 105 mm. guns, which out-range and out-shoot the 75's considerably. This fault is probably being corrected as rapidly as 105's can be turned out.

3. A silhouette which is too high, offering too great a target for the enemy to fire at. It is understood that later models correct this fault, also.



Above is a German mobile artillery piece, mounted facing to the fore, ready to shoot instantly. The U. S. is producing similar field guns, said to be greatly superior to this one.



But this will be America's answer to the Nazis (above). It is a 70 m.p.h. tank destroyer shown in its final tests. Completed, it will mount a large gun and outspeed the enemy!

At last the gun goes into action! From five to 15 minutes have elapsed. Major Wheeler-Nicholson explains that with enemy tanks advancing at 30 m.p.h., guns would have no chance.

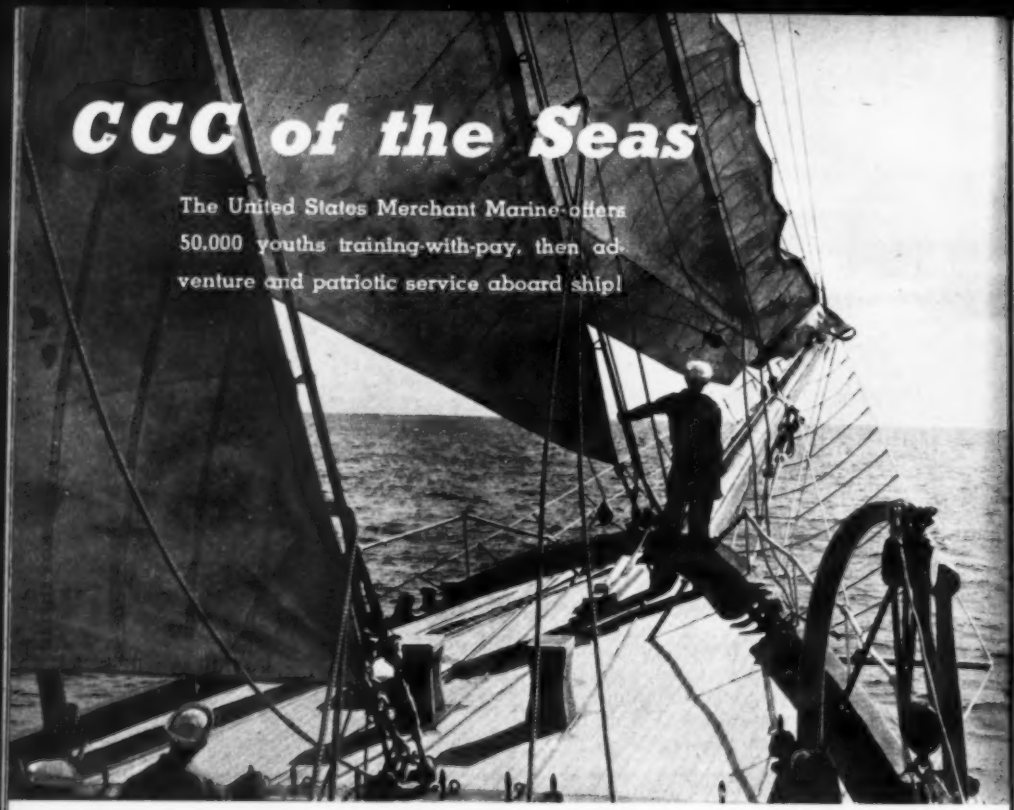
In both the German and the Russian armies, considerable reliance is being placed upon tanks in the 40 to 50 ton class. Until late in 1941, our army had no such tanks whatsoever. Now the new "M-1" tank weighing approximately 59 tons is being turned out in mass production. It is a superb tank, the only fault of the first models being that they, also, mounted a 75 mm. rather than a gun of larger caliber. Equipped with 105's, the M-1 will be superior to any tank of equivalent size in the world. It is to be hoped that a great many of these models will be produced.

The outbreak of the war found us also un-

[*Continued on page* 154]

CCC of the Seas

The United States Merchant Marine offers 50,000 youths training-with-pay, then adventure and patriotic service aboard ship!



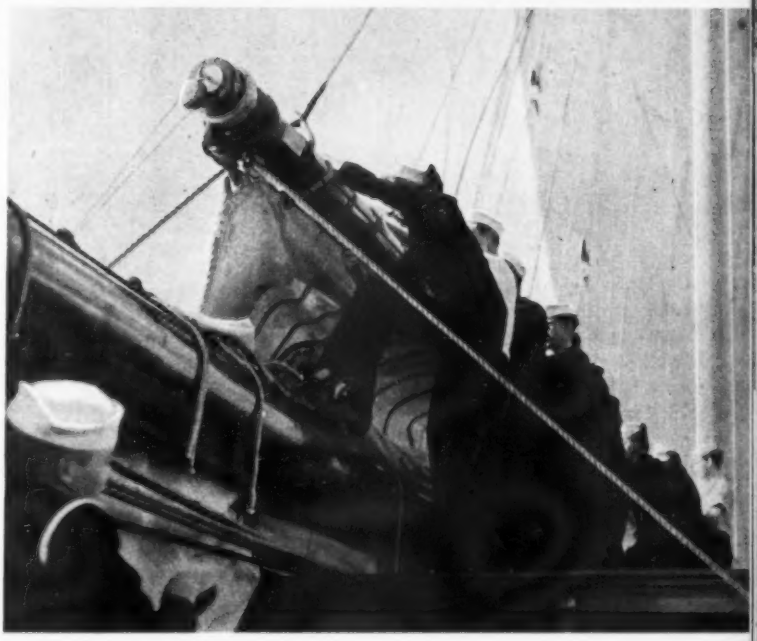
A Maritime Service enrollee serves on lookout duty on one of the two sailing vessels used during half the training.

YOU young fellows who've not yet been drafted, don't want to enlist in the war machine just yet, but are burning to get into the thick of the war excitement—how'd you like to enroll for patriotic, vital service with the CCC of the seas? Its official title: the U. S. Merchant Marine's Maritime Service. You remember President Roosevelt pledged tripling our merchant vessel fleet in order to maintain a bridge of ships of food, clothing, and war material to the democracies of the world. That quick expansion means six months' training with pay ashore and at sea and then jobs for 50,000 of you between 18 and 23 in the next three years alone!

Today that's a prospect that should appeal mightily to any red-blooded young American possessing some of that restless spirit of ad-

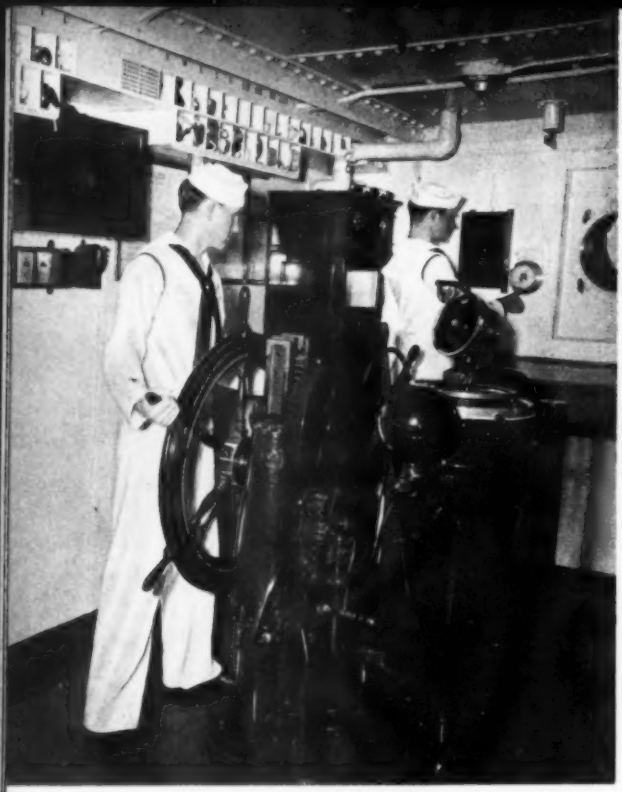
Knowing how to sew canvas properly is as important as use of the various-size ropes shown behind these youths.

Basic sea skills like handling lifeboats, above, gain added importance today when the normal hazards and adventure of ocean service are increased by war conditions. (Right) Handling canvas just like old clipper ship lads!



venture and determination which for generations has caused youths to escape from the routine of an office or classroom by going to sea. For these days, with wolf packs of submarines prowling the routes of ocean traffic, offer more thrilling and hazardous tasks than ever confronted a lad shipping on one of the fleet clipper ships which made this young nation a ranking world power.

The consequent importance of these tasks is told by the anxiety with which our allies in Latin America and in the beleaguered continents the other side of the world look to us to keep up the schedule of ships—it's literally a lifeline to them. And since our war plans rely on imports of certain necessary metals and other raw materials, faithful, intelligent service in our merchant marine constitutes patriotic endeavor of the fine sort young Americans are clamoring to give. The vital nature of this service to the country is, in fact, emphasized by the significant fact that local draft boards have in a good many cases deferred young men who've enrolled for training for merchant marine work. Officials of the Maritime Commission admit this fact and add that, having fulfilled other requirements, a youth who has not yet received his pre-



At noon an officer of the three-masted sailing ship Vema *"shoots the sun" with his sextant to find the location of the ship with its 300 trainees that day. (Left) An enrollee takes the wheel of one of the steam vessels in studying navigation, to prepare for more responsible duties and advanced pay later on.*

induction notice will be accepted for the Maritime Service, the agency which handles the training and educational phases of the enrollees, regardless of his place in the draft registration list.

Since their own program would hardly benefit if enrollees are likely to be taken in the draft in a few weeks or months, the maritime officers apparently are confident that an explanation by a draftee-to-be, concerning his training for work of a nature distinctly valuable to the national welfare, will result in indefinite deferment.

Of course, no one can say publicly that deferment will be granted to draft-age men in the merchant marine. The reason that, officially, maritime servicemen are still subject to draft calls is that they do not have military status. Thus, the set-up's similarity to the Civilian Conservation Corps.

Like the CCC, the Maritime Service enrolls—not *enlists*—young men, if they pass a fairly-stiff physical exam; provides necessary transportation, clothing, and living accommodations at government expense; pays them during a six months' training period ($21 a month—draftee fashion; more in some cases); exacts a high degree of discipline that is not, however, military; and provides supervision and instruction by personnel of the Maritime Commission and of the Coast Guard.

Again, like young men in the CCC, Maritime Service enrollees are invited and assisted to complete elementary and high school subjects, and to take up vocational subjects which will qualify them for good-paying jobs later. They find that they've walked into a really swell spot—they're serving the nation vitally at a time of emergency, getting paid well for it, and completing their educations and learning trades that will get them envied incomes as skilled workmen after the war!

Probably you're wondering, "Why haven't I heard about this before?" Well, apprentice seamen enrollments began only in October, 1939, the Maritime Service having been established by the Maritime Commission under the provisions of the Merchant Marine Act of 1936 which officially recognized the great need of training for the personnel of the merchant marine. Since 1938, six training centers have

[*Continued on page* 155]

POWDER PUFF METALS

An entirely new science of metal presses bearings like briquettes.

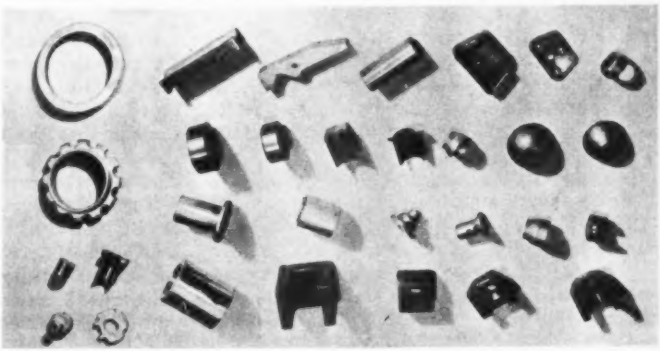
Talcum powder metal is either poured into a hollow steel die and pressed into briquettes (left) or scooped into a hydraulic press, as seen below.
Photos by courtesy of Automobile Facts

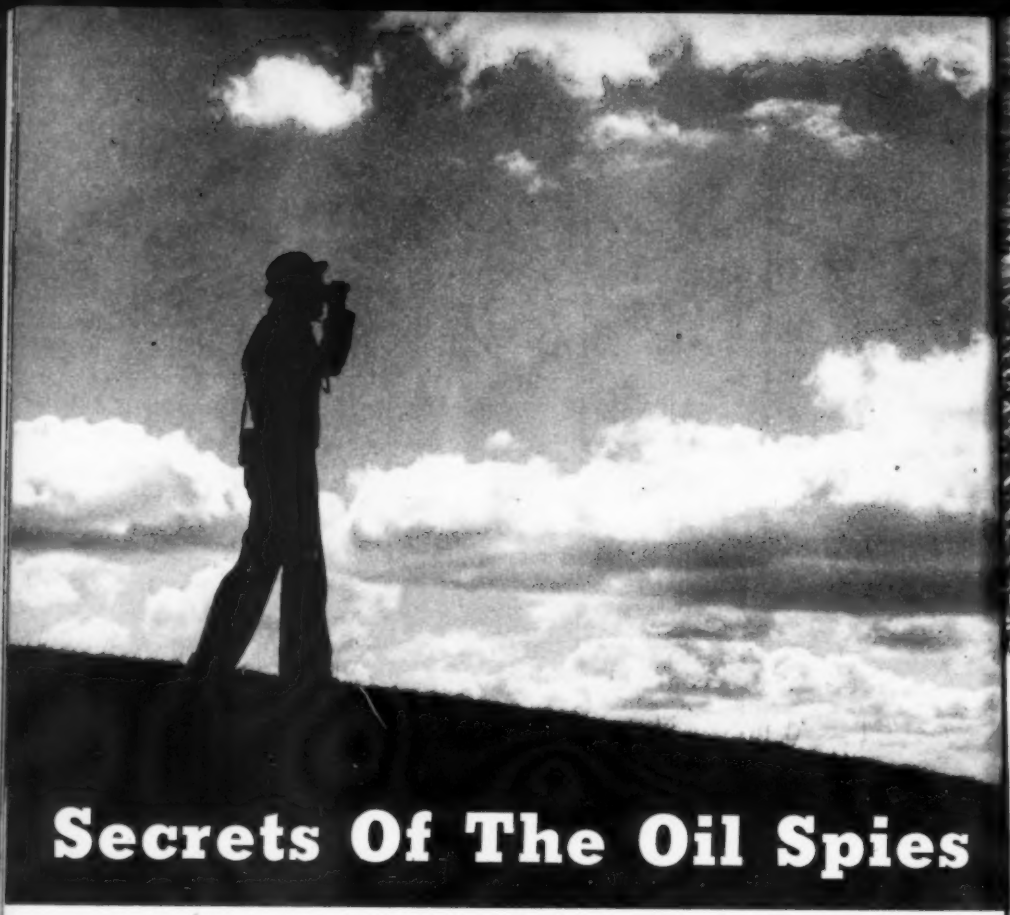
YOU make an automobile or tank gear nowadays that same way the corner grocer ladles out a scoopful of flour. You simply shovel powder into a hydraulic press—and out comes the gear!

These gears have all the desirable qualities of gears made in the ordinary way—plus a few extra advantages. Yet they are made from metal that never saw the inside of a blast furnace, Bessemer converter, or open hearth. The metal was never melted, forged, cast, rolled, annealed, extruded, or hammered! The teeth of these gears were never hobbed. Their holes were not drilled. They were never milled or ground!

This is the new magic of powder metallurgy. Discovered at a time when the war had tied up the majority of machine tools and dies in the nation, powder metallurgy has proved a life-saver for industry. [*Continued on page* 164]

Here are a few powder metal parts, which go into machines ranging from guns to airplanes.





Secrets Of The Oil Spies

As mysterious as the operations of the "Gestapo" are the spying activities of secret scouts in the oil exploration game.

by Hoyt Barnett

BEHIND every gallon of oil that propels America's tanks and battleships and greases the wheels of American war effort, there lurks the story of an espionage system as secret, as thrilling, as shadowy as the *Ogpu* or the *Gestapo*. It is the story of the oil scout—the spy of an industry that still lives by its wits and its willingness to gamble.

The oil scout is a modern Daniel Boone—a combination of Indian, bloodhound, frontier gambler, F.B.I. agent, cross-country runner and Einstein. By his astuteness, he may cut his own company in on a billion-dollar oil field.

Recently, field geologists for a Kansas wildcat oil concern reported by coded message to their headquarters in Wichita, Kans., that they had found a district in central Canada that looked promising. They asked that a seismograph crew be sent to the district to make further tests.

Now, the seismograph crew is the advance guard of an oil exploration army. Such a crew is made up of from one to a dozen trucks containing seismograph instruments. These instruments are exactly like the seismographs with which scientists record earthquakes. But oil exploration companies put them to a

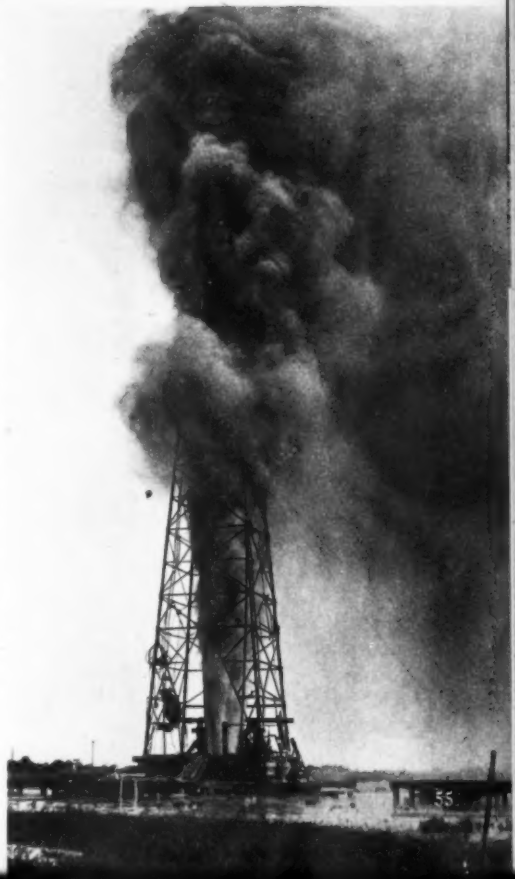
An oil scout's dream! Above, a striking photo showing typical shape of an oil "dome" sprouting with derricks, in So. California. Right, a gusher comes in, in an Illinois field.

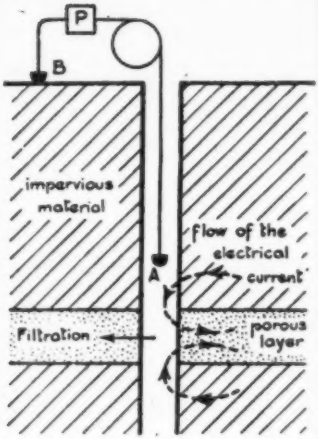
different purpose: They set off a blast of dynamite in a well-hole and the seismograph "listens" for the earth tremor thus created to go down into the ground until it strikes a hard layer of rock, and then "bounces" back. By the length of time it takes the "echo" to come back, the seismograph crew can tell how deep the rock formation lies beneath the surface—and in this way important geological information can be obtained in searching for oil formations.

The movements of a seismograph crew are as carefully guarded in the oil industry as the movements of the U. S. Navy are guarded in this war! For every new oil field that is opened up must first be surveyed by a seismograph crew. And if the scout of a competitor can discover where your seismograph crew is operating and what it has learned—then your competitor may execute a "pincer movement" on you and lease up all the land around your new oil field!

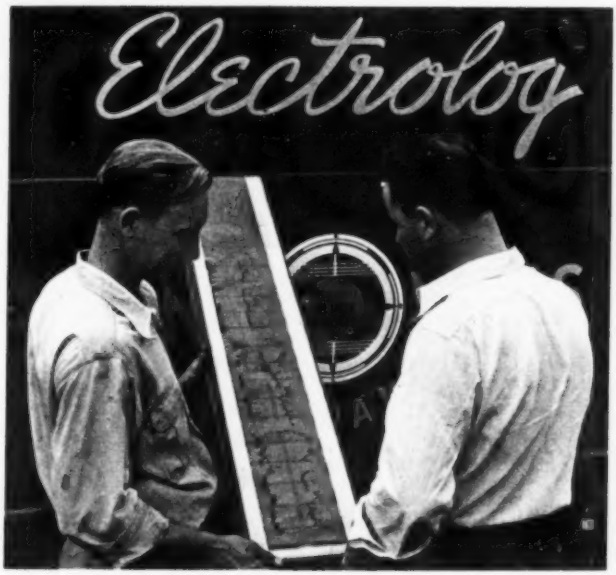
The Kansas wildcat company, therefore, used every precaution possible in calling in its seismograph crew and directing it to the possible new field in central Canada. This new district might well turn out to be a new oil bonanza.

And the Kansas company wanted to be sure to keep the secret for itself.





The "electrolog," uncanny electric device which often locates producing oil wells in holes which had been given up as dry. Left, an electrolog is lowered into a well. It records resistance of strata to an electric current, diagrammed above. Below, the record by which strata are identified.



Consequently, the Kansas concern sent a messenger to its seismograph crew (which was then operating in southern Illinois) and ordered the crew to report to headquarters. The Wichita office did not trust the telephone or the mails, for fear of competitors' oil scouts! The messenger knew nothing about the crew's new mission. His job was only to tell the crew to report to headquarters—and to do so as quietly as possible.

A few days later, the crew of eight trucks showed up in Wichita, and the foreman reported at the head office. He was told to take his crew north on U. S. Highway No. 81 to Fargo, N. D.

"When you get to Fargo," the president told him, "I will meet you at the office of the Fargo Forum and tell you your route from there."

The foreman and his crew of eight trucks drove several hundred miles to Fargo without knowing, themselves, where they were going. At Fargo, the president met them again and told them the name of the town in central Canada where they were to headquarter for their field tests. They made their way to this tiny Canadian prairie town by a circuitous route, arranging their schedule so they would arrive at night.

When the crew foreman and his crew walked into the lobby of the small hotel where they planned to stay, they got the shock of their lives: Leaning against the hotel desk were two men whom they immediately

recognized as oil scouts for rival companies!

For the three weeks during which the seismograph crew operated in this area, they were spied upon every hour of the day by the rival scouts. Their every "set" with the seismograph was viewed through the binoculars of their competitors' spies.

The spies learned for their employers practically everything that the Wichita wildcat concern learned through expenditure of several thousands of dollars on seismograph work!

The Wichita wildcatter got a good case of apoplexy. The oil spies got raises!

Oil scouts can best be described as the reporters of the industry. Their task is to pierce the wall of secrecy surrounding new wells, new fields and new methods of production, and publishing the facts to all who buy their services. They are in the oil "game" too, and in their sphere of operation are called upon for the same keen use of wits and muscles that puts a tang in any adventurous way of life.

Stories told of them are legion in number, gargantuan in proportion and virtually impossible to verify, since in almost every case the only one who can admit or deny the tale is the scout himself and he won't talk until the statute of limitations has operated in his case and the passage of time has dimmed the memory of his deeds. And oil men have notoriously long memories.

Every time a "no dope hole" is encountered, it presents a challenge which is gladly met, and in the meeting may produce such stories as those told of E. O. Olson of Murphy & Olson Scouting Service; Ed Lucas of Standard Oil; Charles L. Hall, formerly of General Petroleum; Bill Pemperton, who once worked for Guggenheim interests, and many others.

One such tale has to do with a scout of rather heavy proportions who sneaked up one night on a "no dope hole." He wasn't sure what he'd find, but if he could overhear a word or two the added clue might aid in crystallizing some half-formed notions.

As he crept slowly along like a scout for Sitting Bull, he bumped his head against an old oil can. Detouring this he edged toward the derrick. His hand struck a pipe and to his experienced touch it spoke of oil—moving from the well into a storage tank, and this well was supposed to be still going down.

Further exploration, not in its nature geological, disclosed a pipe coupling from which oil could be drained, but into what?

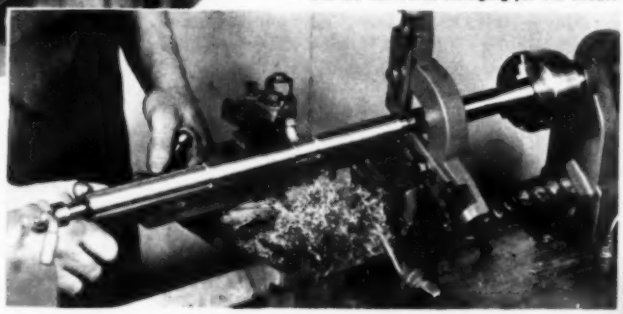
[*Continued on page* 167]

Another method of discovering the secrets of the earth's bowels: the coring drill. It is run thousands of feet into the earth on drill (above) and brings up sample like that below.

SHORTAGES

It's patriotic and practical to keep your workshop hobby going—if you avoid new metals and utilize scrap that's not needed for making the sinews of war.

Your workshop won't have to slow down if you apply the time-honored slogan, "Necessity is the mother of invention," to all your operations.



Below: A broken, discarded axle shaft provided the material for this turning. Bottom: A wrecked vacuum cleaner can supply a wealth of useful small metal parts, plus an electric motor and fan. Items like this are not worth salvaging for war needs.

by
Bertram Brownold

"GUESS I'll have to lock up the workshop for the duration, and take up knitting or something."

Thus spoke an ardent shop-hobbyist friend of mine on a recent evening. He had spent a fruitless Saturday afternoon making the rounds of local hardware stores and other usual sources of the metals he needed to pursue his basement bacchanals. He was definitely depressed and even the jolly potion with which he was refilling our glasses couldn't seem to disperse the horrible vision of a canvas cover gathering dust over his new South Bend lathe.

"Couldn't get so much as a piece of steel rod to turn the cylinder studs for that little engine I'm building—and that's not all; I hear there's going to be a lumber shortage, too."

He drained his glass with a gurgling moan.

Being a helpful, annoyingly optimistic sort of chap, I was unable to share his gloomy outlook and said so, perhaps a bit unsympathetically. I also had a suggestion.

"If you can't get new material, why not use something else, and fit it to your needs? That old, rusty lawn mower that's been kicking around your garage for a couple of years,

Needn't Worry Workshoppers

for instance. Surely, with the aid of a little elbow grease you could make the parts serve, somehow."

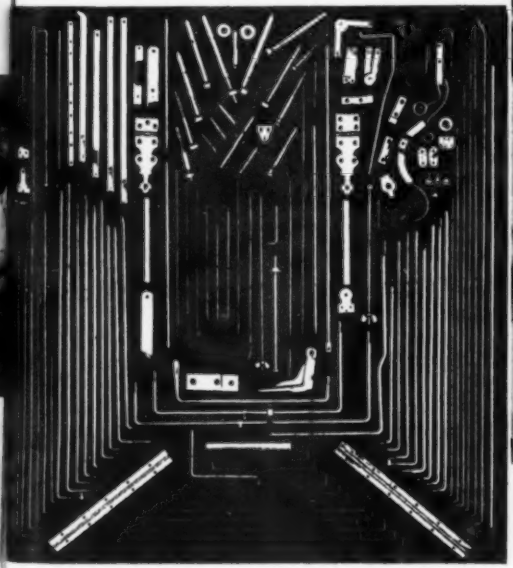
My friend gave me a withering stare.

"What could I possibly do with that worthless junk?" he asked pleasantly.

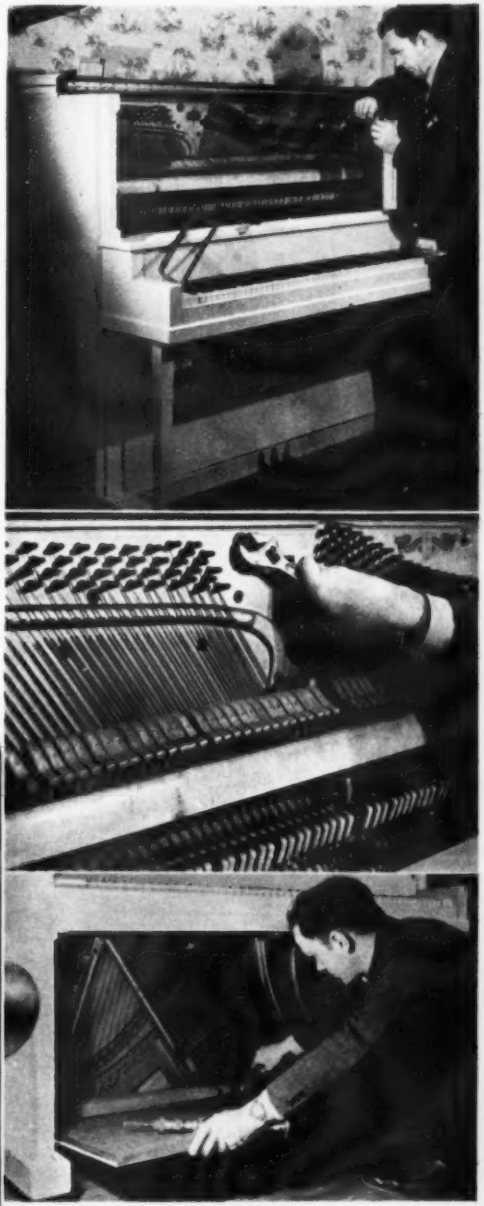
I'm very persistent when aroused. "If my memory isn't failing me, that mower has two or three long, thin steel bolts holding the frame together. How about turning your studs out of those?"

Well, the upshot of it was that my friend *made* the studs from the lawn mower bolts, completed his engine successfully. He also had a whole new vista of materials for future projects opened up to him, and is going to use his imagination and ingenuity from now on. Knitting is definitely out.

The amateur craftsman, the handy man, the man who loves to use tools and who enjoys making things may, in these days of shortages and priorities pause and wonder whether he is going to be handicapped in the pursuit of his hobby by difficulty in getting the materials he needs. Perhaps he has already found that his local hardware store is "out" of this or that small requirement and is unable to tell him just when they will have it again. Per-



Below: A few of the 200-odd metal parts that can be resurrected from the average old upright piano. Note fine hinges.



Disassembling a junked piano. This one cost exactly $5.00. Top and center: Removing screws and lags from sounding board. Lower: Bolts holding metal frame at bottom are loosened. Taking a piano apart is a man-sized job, but the yield in material is more than worth it.

Above: A few sources of useful metal parts, including a discarded ball bearing lawn mower, paint can and oil can. In foreground is a steel spring from a broken mechanical toy. Left: an old mower and some miscellaneous scrap parts (including pipes) plus a washing machine motor were converted into a kindling saw.

haps he has invested in power tools, motors and other equipment and is a little dubious as to whether, because of future shortages of materials, his investment will pay him the dividends he had hoped they would—dividends in the form of happy hours spent at the lathe or jigsaw producing well made, good-looking things.

If he has been assailed by these doubts and fears, he can now cheer up, for his worry is very largely groundless. The truth is that if he will seek his materials in places other than the obvious ones he has always frequented, and if he will run down certain easily accessible avenues that this article points out, he need not fear that the work bench and the lathe must be abandoned. On the contrary, he will find all the material he needs and to the pleasure his hobby has always afforded will be added the new pleasure of fitting to his needs certain materials with which he may not previously have been familiar and which were, perhaps, originally intended for other uses. *And he can do this with a clear conscience,* for the materials he will use are of no value in the national defense effort—not even salvage value.

The two materials most important to the amateur craftsman are wood and metal.

The former is plentiful (contrary to my friend's belief) and nobody needs advice as to where to get good lumber. The yards are all well stocked and future supplies seem assured. Frank K. Hóman and L. F. Kreyer, executives of the Dykes Lumber Company, one of the largest lumber concerns in the East, asked about the possibility of a lumber shortage, said that none now exists and that they are unable to see any reason for a shortage developing at any near future time. Maple, walnut, birch, beech, oak, ash, chestnut, hickory, basswood, whitewood, pine (all kinds) gumwood, poplar, and others too numerous to mention are all freely available at reasonable prices and will undoubtedly so continue for an indefinite time.

Questioned specifically about spruce, in connection with which there have been rumors of a shortage due to demands of the airplane industry, Mr.

No lumber shortage is in sight, and most yards are well stocked with various woods.

Above: Another saw, this time a drag saw, made from the farm junk pile and a washing machine motor. Its inventive builder, Ray Wolferding of Sunman, Ind., says it'll cut through 2½-ft. logs as though they were cheese. Right: Scrap metal dealers are still a source for the craftsman, though their stocks are diminishing due to war demands.

Kreyer replied: "The more specially selected spruce the airplane manufacturer uses the greater will grow the supply of the standard grades of spruce." The explanation to this apparent paradox lies in the fact that the airplane industry can use only a very small part of each spruce log cut. The remainder, and by far the greater part of the log, cannot be used for planes but it is still excellent spruce and quite suitable for all normal uses.

The same situation holds in respect to fir used by boat builders. Only a carefully selected part of the log is suitable for boat construction and the greater the quantity of fir the boat people use the greater will grow the stocks of standard grades of fir suitable for other purposes.

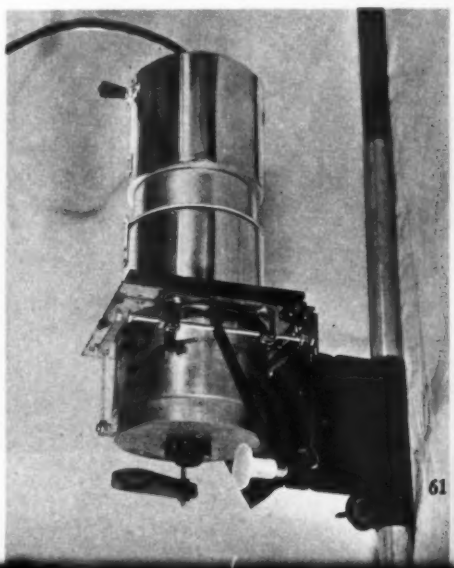
Metal, however, is a different story. Here there already are definite shortages and the situation will undoubtedly grow more acute while war conditions continue. How can the amateur craftsman obtain the relatively small quantities of metal he would like to have? And once he has them how can he avoid feeling unpatriotic in using them in the pursuit of his hobby?

In respect to the latter phase of the

[*Continued on page* 163]

Below: Old auto chains and a broken horn of an obsolete type furnish clips, steel, nuts, bolts, wire, a small magnet, the chrome plated brass shell and other assorted parts.

Right: A 50c drip coffee maker, some pipe and miscellaneous odds and ends went into this excellent photo enlarger.



"BABY" CARRIERS

Far-sighted Navy planning has devised this answer to the threat of Nazi "catapult" bombing.

by W. M. Kimball

The "Friesenland," Nazi "baby" carrier (above), catapulted bombers in New York Harbor in 1938. Navy believes it was a dress rehearsal for war!

AIRCRAFT carriers one-fourth the tonnage of the huge *Lexington* and *Saratoga*—largest, most expensive, and vulnerable members of the United States fleet—are the smart new weapons protecting our ships and shores. Thanks to the foresight of our Navy, keels and hulls of merchant vessels are now being converted in 45 days into an airplane carrier force that shipyard observers figure will soon be fifty strong!

That means our Navy is meeting the perpetually-changing threats of aerial warfare with a revolutionary technique: a *fleet* of "baby" tenders. Eight airplane carriers of the familiar, enormous type mothering 100 planes have been the most any country has been able to boast because of their great cost and a need limited to the number of

The Saratoga (left), our largest carrier, took 5 years to build. New "baby" carriers (pre-conversion model on opposite page) are obtained in 45 days!

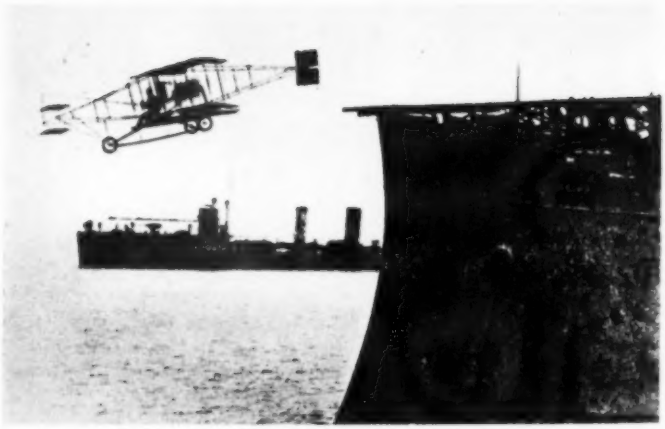
--Our New Weapon!

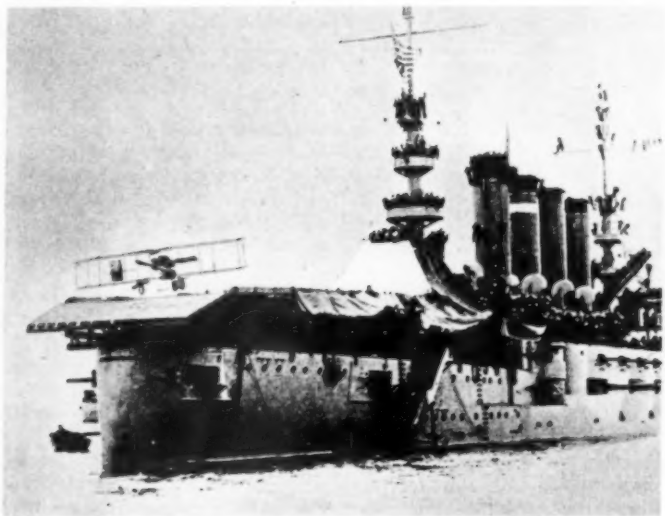
Admiral Emery Land (above) shows model of merchant ship he designed for construction under the Maritime Commission's schedule expanded in the early '30s. They can be converted in short time to "baby" carriers, to combat the Nazi bomb threat.

planes assigned to carrier duty. Until now, therefore, *fleet* has been a word never considered in terms of airplane carriers. That the United States is rapidly acquiring a fleet of such ships unmistakably implies the impressive gain in air power that alert, prophetic planning is acquiring for us. The U. S. this time has the jump on the world!

This new midget carrier extends our coastal armor to mid-ocean and should nullify the potential bomb threat to our shores that exists in a Nazi weapon our naval experts had a chance to study as recently as 1938, right in New York City's harbor. In that year the 6800-ton German ship *Friesenland* successfully launched four-engined Blohm and Voss Hal seaplanes into the air for more than 100 flights from Long Island Sound to Germany. Those arrogant displays of a new plane-and-ship use may well have been dress rehearsals for attacks on coastal cities of the United States by medium, long-range bombers catapulted from mother ships based in mid-ocean.

That possibility was envisioned by naval planners, whom the demonstration impressed with Nazi might's new and ominous nearness. "Baby" carriers will enable the Navy to send squadrons of planes thousands of miles at sea before they ever take the air to overwhelm catapult bombers and their small mother ships. Hitler has not yet employed such combinations of sea and air craft but when and if he does, the U. S.' growing fleet of little





but many carriers probably will be the defeating weapon against them.

If so, it will be a case of protection being devised by American aviation experts from a better use of the same weapon used by the attackers. The mother ship, though small, is of considerable significance in the set-up exemplified by the *Friesenland,* since such a ship is capable of acting as supply base, hospital ship, refueling base for submarines, as well as launching device for the bombers at least 600 miles from the plane's objective.

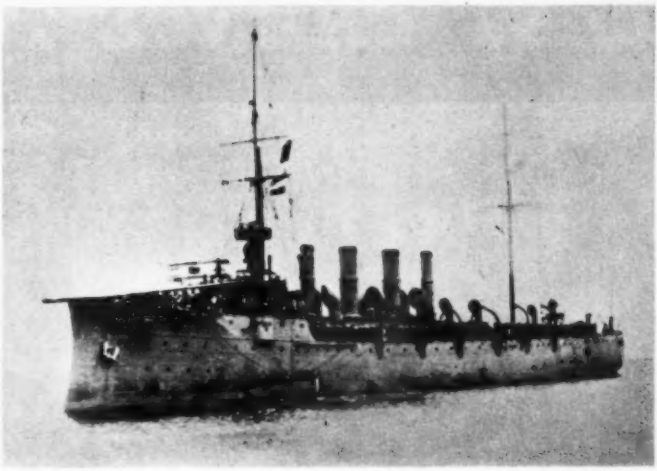
The Navy's use of baby carriers may be "the better use of the same weapon." The 20-knot vessels are faster than the German ships by 4 knots. The striking power of its patrol bombers and fighters might be compared as a machine gun to a single shot muzzle loader. And a fleet of them ranging the Atlantic could thread the skies from Greenland to Panama.

Seven 10,000-ton ships laid down in the last year in the Maritime Commission's building program, have been recently converted to this new type "mother" of the Navy's fast scout and bombing planes. More and more frequently during America's two years of

First take-off of an airplane from a ship and first landing of an airplane on a ship—the birth of the carrier—is shown in these photos. Top, Eugene B. Ely is seen taking off from deck of U.S.S. Birmingham. Bottom two pictures show Ely landing on deck of the U.S.S. Pennsylvania, on January 18, 1911, an epic date.

defense effort, the Navy has been taking over the keels and hulls laid down for Standard Oil, Texas Company, coastwise freight lines and even the smaller hulls of fishing fleets.

Utmost secrecy, of course, veils plans for future construction, but the rapidity with which these were converted from keels and hulls planned for merchant vessels indicates that the estimated strength of fifty will not be far away. The first conversion reported was that of the *Mormacmail*, now the *U.S.S. Long Island*, which took 90 days. Today the change-overs are being made in half that time!



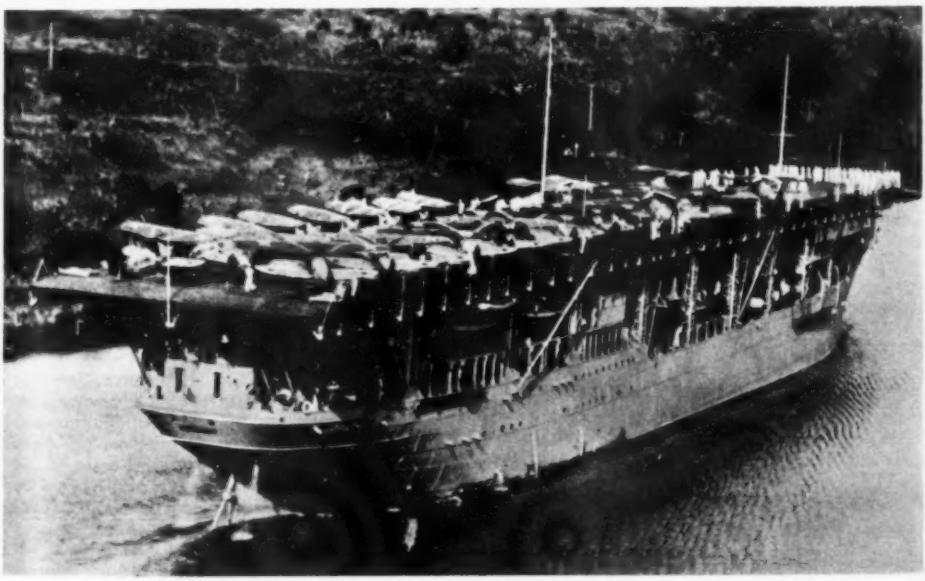
First "aircraft carrier" in the world! **U.S.S. Birmingham,** *as Ely took off from it.*

That effective, powerful war vessels for various purposes can be commissioned so rapidly is due to the comprehensive shipbuilding program which far-sighted Admiral Emory S. Land fought, argued, and cajoled to get approved back in the doldrum '30's. Armed with model ships, facts, and figures, he finally won recognition for his ideas and became director of the Maritime Commission when the construction program he advocated was begun. He applied to ships the mass production methods at which American industry excels. Seven basic plans were drawn and keels and hulls of tankers and cargo vessels made of mill-fabricated steel. The ways became assembly plants.

More important, those basic plans provided

[*Continued on page* 168]

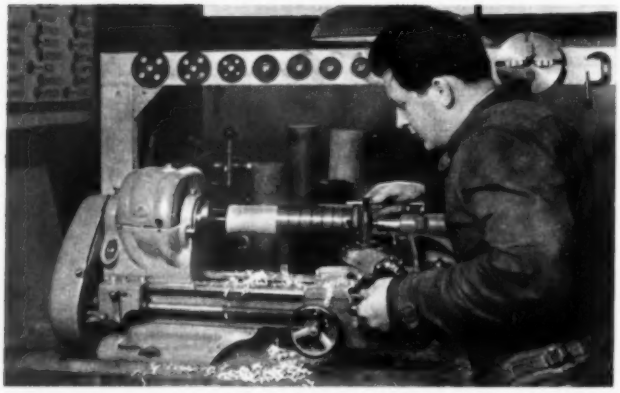
America's first complete aircraft carrier, the **Langley,** *was a converted collier. Looked like an old woman on stilts.*



LAST CHANCE TO WIN TH

FIRST PRIZE

$1,700 AERONCA Defender Trainer, 2-place, 65 h.p. Cabin plane! 250-mile cruising range, latest 1942 model! Win it!



THIRD PRIZE *$240 ATLAS lathe! It is the last word in shop equipment. Has reversible automatic power, 16 spindle speeds, wide range!*

LAST call for the big MI contest! Only a few days left to complete and mail your entry blank to be eligible for the great MECHANIX ILLUSTRATED prizes!

Just take a glance at the awards shown on this page and on the next eight pages —a $1,700 Aeronca Defender Trainer plane, a grand Crosley convertible, four-passenger automobile, a $240 Atlas lathe, a Revere Turret Model movie camera and Revere De Luxe Projector, a $110 Lord Elgin wrist watch, and nearly 100 others! All of these prizes will be awarded absolutely

N THESE SWELL PRIZES!

A $1,700 Aeronca Defender Trainer, $466 Crosley Sedan, $240 Atlas lathe, and thousands of dollars in other prizes—ABSOLUTELY FREE TO MI fans!

free to lucky readers of this magazine!

And here's the swell part of it: All you have to do to win one of these prizes is to play the fascinating MI "Words-Within-Words" game — the winners will be those entrants who comply with the rules and turn in the highest scores! That's all there is to it. You'll find it more fun than a picnic!

So take a look at all the prizes pictured here RIGHT NOW—then turn on to pages 76 and 77 for the rules and this month's "Words-Within-Words" game.

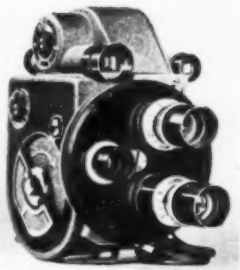
You'll find the rules extremely simple and the game the most fun of any you have ever played!

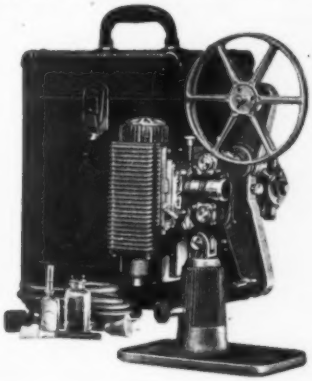
There are no essays, no catches!

But this is the last call!

SECOND PRIZE

$466 CROSLEY sedan. Convertible, 4-passenger, all-steel body! Gets 50 miles to gallon of gas. Has heater, spare tire, air-cooled motor, 4-wheel brakes!



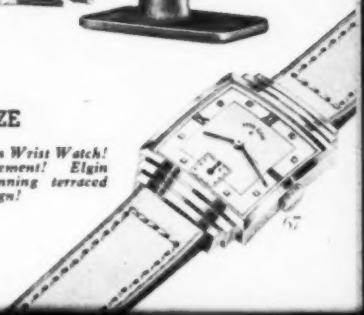


FOURTH PRIZE

REVERE Turret Model movie camera and Revere De Luxe Projector! Value $167! Black and white and Kodachrome film!

FIFTH PRIZE

$110 Lord Elgin Wrist Watch! 21-jewel movement! Elgin guarantee! Stunning terraced design!



DETAILS ON PAGE 76

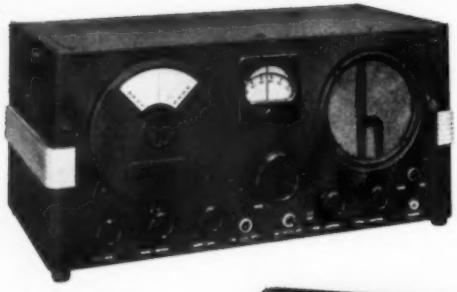
6th PRIZE

WALKER-TURNER $99.50 Variable Speed Lathe! Rugged, safe! Drive speed 260 to 4,200 r.p.m.!

7th PRIZE

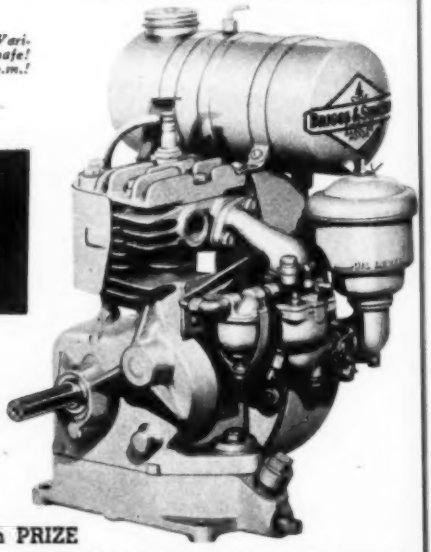
FLYTIMER All-Purpose Watch! Value $82.50! Water-proof, shock-proof, dust-proof! 17-jewels!

Free Prizes!



9th PRIZE

HALLICRAFTERS Marine Radio! Value $74.50! Skyrider Marine Model. AC/DC on 110/125 volts!



8th PRIZE

$75 BRIGGS & STRATTON boat engine. Air-cooled, 4-cycle, fits almost any boat! Includes oil bath, air cleaner, gas filter, high-tension magneto and muffler.

10th PRIZE

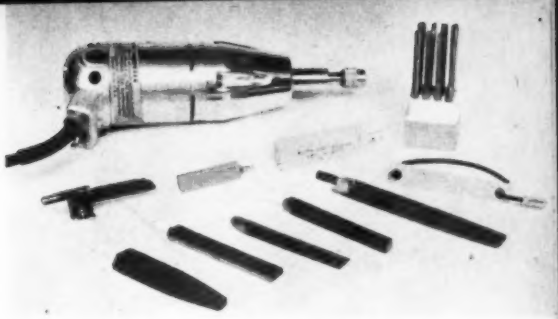
SEA-PAL $68.75 Radio Direction Finder! Complete with batteries, headphones, charts. Dynamic speaker, long- or short-wave!

11th PRIZE

UNDERWOOD Typemaster Champion Portable! Standard keyboard, rugged construction! Used by writers, journalists, business executives!

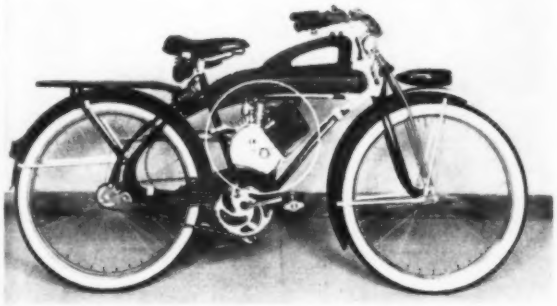
12th PRIZE

HAMILTON Elton $60.50 Watch! 17-jewel, 10-size movement! 14-K gold-filled! The watch of railroad accuracy!

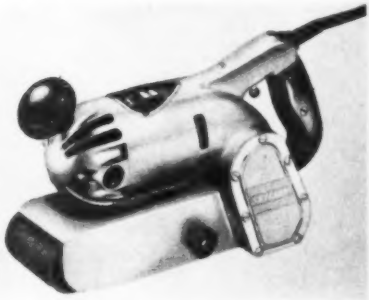


13th PRIZE

$60 H & H RESEARCH CO. filing and honing tool! Senior Model, reciprocating action! Does filing, honing, polishing, snagging, etc.!



14th PRIZE *WHIZZER $59.95 Bicycle Motor! Weighs 28 lbs., fits any bike! 120 miles to gal., does 25-30 m.p.h. Easily installed, permits pedalling.*



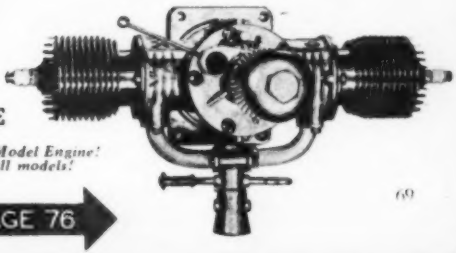
15th PRIZE *$50 ZEPHYRPLANE, JR., Belt Sander! Lightweight, Skilsaw product. Produces ripple-free finish in a jiffy!*

16th PRIZE *Choice: Portable GUILD CUTTER or GUILD SANDER! $48.50 Value! Both are ideal for homecraftsmen! Rugged, sturdy construction!*

17th PRIZE *TEACH-A-PHONE course U.S. School of Music! 96 lessons! Value $45! Famous Print and Picture method, 16 records, all instruments!*

18th PRIZE

EDDIE BAUER Pure Down, blizzard-proof sleeping robe! Value $40! Mfg. by Ed Bauer, Seattle.



19th PRIZE

HERKIMER O. K. TWIN Model Engine! Costs $40! For use on all models!

DETAILS ON PAGE 76

More Prizes!

20th PRIZE

$35.15 DELTA 24", 4-speed scroll saw! 4 blades! 4-speed cone pulley on arbor! Timken crankshaft! Shaft-driven blower pump!

22nd PRIZE

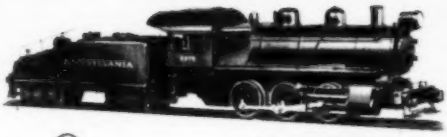
$30 MOTOROLA Wireless Automatic Record Changer! Takes 8- and 12-inch records on any radio!

23rd PRIZE

$25.90 FEDERAL Enlarger! Has f/6.3 Anastigmat lens! Vibration-proof, modern, foolproof!

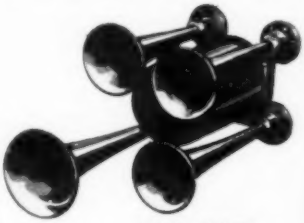
25th PRIZE

MOSSBERG "Targo" Skeet Set! Value $25.50! Has gun, ammunition, targets, net!



21st PRIZE

$35 LIONEL locomotive! Inside and outside 3rd rail collectors! Scale model couplers on pilot and tender. Approved by NMRA!

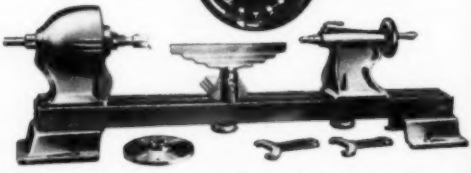


24th PRIZE

SPARTON MUSIC-AIRE Horn! Value $25.60! Choice of 4 models! Complete with assembly parts!

26th PRIZE

WESTON $25.50 Exposure Meter! For still, movie cameras! For dim, bright light! Ultra-sensitive, Weston "Master" model!



27th PRIZE

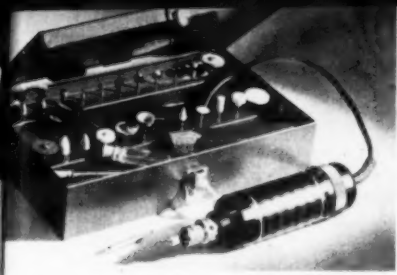
$25 BLUE STAR Lathe! Greater capacity, new refinements, heavier design! 4 speeds, ball bearings!

28th PRIZE

$25 PFLUEGER "Supreme" Satin Nickalum fishing reel! Lightweight!

29th PRIZE

$25 WINNER Water Skis! Waterproof! Rubber foot harness!

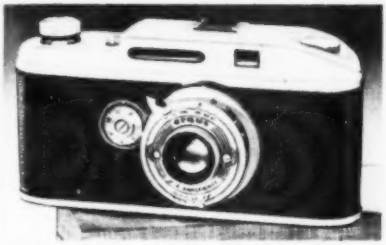


30th PRIZE

$25 Ultra De Luxe "HANDEE" Workshop Tool! 27 accessories! For grinding, polishing, cutting!

31st PRIZE

DYNAMIC $24.75 Super-Charged Welder! High-grade transformer type! High Heat Output!



32nd PRIZE *ARGUS A3 $23.85 Ceiex Camera! Streamlined, f/4 Anastigmat lens, 18-36 exp.! 35mm. film!*

33rd PRIZE

BAUSCH and LOMB $22.50 Microscope! 75/-300 diam. magnifications! With all equipment!

34th PRIZE

CORSAIR II $22 35mm. Camera! Built-in exp. meter. f/4.5 Anas. lens!

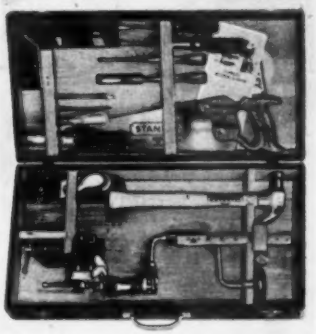
35th PRIZE *GENERAL ELECTRIC $21 Triple-Whip Mixer! Three-beater! High-torque, permanently-oiled motor!*

36th PRIZE *EDDIE BAUER $20.50 Blizzard-Proof Down Jacket! Lightest, warmest on earth! Made by Eddie Bauer, Seattle.*

37th PRIZE *Flexible Flyer $20 SPLIT-KEIN Skis! Designed in Norway by experts! Mfg. by S. L. Allen Co.*

38th PRIZE *U. S. Rubber Co. MILITARY RAINCOAT! Value $20! Loose-lined double-breasted gabardine!*

39th PRIZE *$20 STANLEY Tool Chest! Has hammer, screw driver, bits, chisels, auger, etc.! 17 tools!*



40th PRIZE

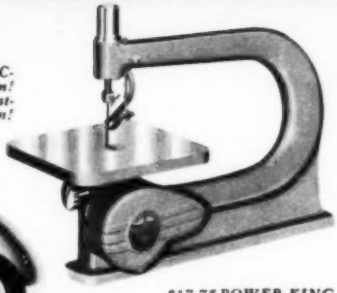
KALART $20 Automatic Speed Flash! Mechanical, self-cocking, universal synchronizer! No winding! No cable!

DETAILS ON PAGE 76

More Prizes!

41st PRIZE

$19 F. A. Smith ARCTIC-AIRE Fan! Streamlined, dustproof, modern 12" fan!



42nd PRIZE

$17.75 POWER KING 15" Jig Saw! Handles light to 2" wood! Sturdy, accurate!

43rd PRIZE

Wilson $17 DON BUDGE Autograph Tennis Racket! Finest lamb gut! Strata-Bow frame!

44th PRIZE

DOOLING $17 Model Racer! 12" long, does 70 m.p.h. Approved by champions!

45th PRIZE

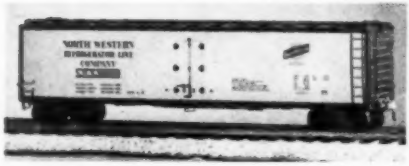
SHEAFFER $16.73 "Tuckaway" Pen and Pencil Ensemble! 1/10 14K gold-filled, lifetime gudrantee!

46th PRIZE

$16.50 FEE & STEMWEDEL 3-power Field Glasses! 40mm. Achromatic lens! Wide vision!

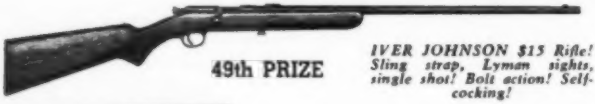
47th PRIZE

EDDIE BAUER $16.50 Pure Down Quilted Blizzard-proof Jacket! Light, warm, made by Eddie Bauer, Seattle!



48th PRIZE

$15.75 LOBAUGH Model C & NW Refrigerator Car! Exact scale! 12½" long! Ready to run!

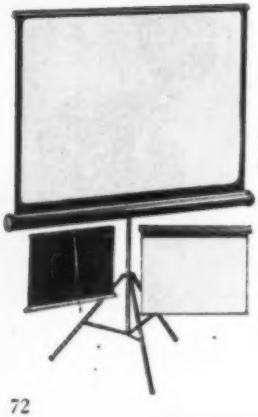


49th PRIZE

IVER JOHNSON $15 Rifle! Sling strap, Lyman sights, single shot! Bolt action! Self-cocking!

52nd PRIZE

GILBERT $13.50 Erector Set! Builds hundreds of thrilling marvels! Made by A. C. Gilbert!



50th PRIZE

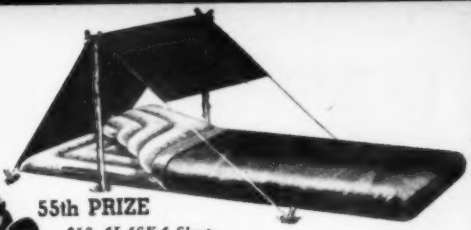
$14.50 RADIANT 3-way Projection Screen! For stills, movies! 30"x40"!

51st PRIZE

SHWAYDER BROS. $13.50 Men's 2-Suit-Traveling Bag! Strong, roomy! Accommodates complete wardrobe!

54th PRIZE

$12.50 JUNIOR Model Motor! Ready to run! Has spark plug, coil, condenser!



55th PRIZE

$12 ALASKA Sleeping Bag! Flannel-lined, storm-proof! Alaska Sleeping Bag Co., Portland, Ore.

53rd PRIZE

$13 WILCOX CRITTENDEN Marine Lamp! Reg. Marine Side Light! Polished Brass!

56th PRIZE

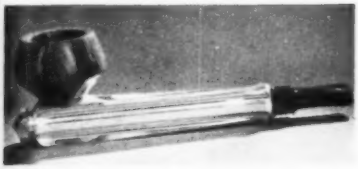
$10.95 G-M Exposure Meter! F/1.4 to 32! Jeweled movement! Accurate!

57th PRIZE

RONSON $8.25 Silver-plated Table Lighter! Modern Danish design! Compact, ideal with silverware!

58th PRIZE

$8.50 WESBAR Car-Top Carrier! Heavy duty! For boats, canoes, skis, sleds! Fits all cars!



59th PRIZE

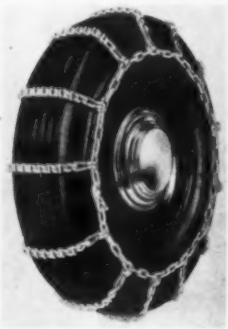
KIRSTEN $8.50 Radiator-type Pipe! Filters the smoke! Takes out bite!

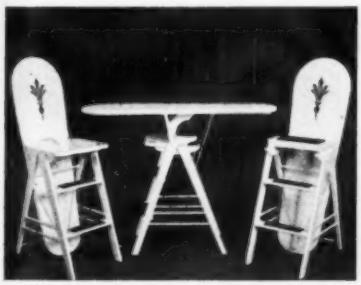
60th PRIZE

$8.25 HODGMAN Parka! Vulcanized, rubberized! Zipper front, storm-proof!

61st PRIZE

$7.75 WEED Tire Chains! Non-kinking! Electric welded! Save your tires!





62nd PRIZE

CRAFTY-AID $7 Home Step Ladder! Chair, table, tray, ironing board combined!

63rd PRIZE

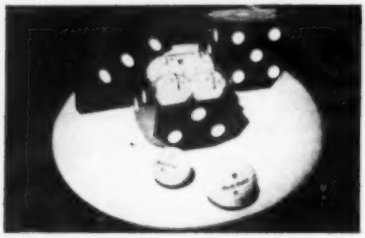
$6.75 COMET Sailplane Gas Model Kit! With retractable gear, prop saver, etc!

64th PRIZE

G. H. Q. Gas Model Motor! Not a kit! For planes, boats, cars! Ready to run!

DETAILS ON PAGE 76

More Prizes!



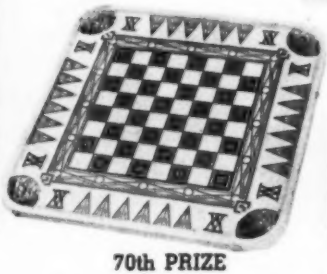
65th PRIZE

MILES KIMBALL Personalized Golf Balls! Your name on 8 balls! Cost $5.65!

66th, 67th & 68th PRIZES

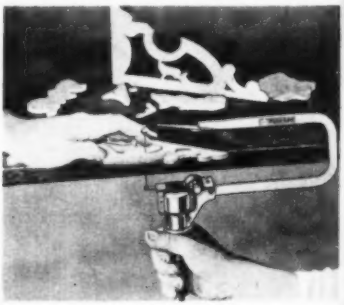
3 INGERSOLL Sweep Second Wristwatches! Value $5.50 each. Second hand sweeps whole dial. For nurses, athletes, etc.!

69th PRIZE *$3.50 EVERHOT Timer Clock! For turning fans, radios, heaters, on and off!*



70th PRIZE

$5 CARROM Game Board! Tournament size. Hardwood veneer. 57 different games!



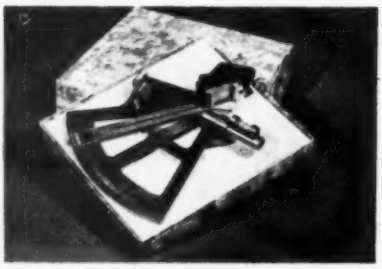
71st PRIZE *$4.85 DREMEL Moto Saw! For high-speed cutting. Uses same current as 75 watt bulb!*

72nd PRIZE

$4.75 TROJAN Binoculars! Perfect optically! Complete with carrying case!

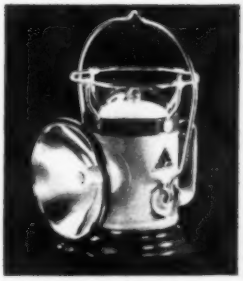
73rd PRIZE

DAISY $4.50 Pump Repeater Air Rifle! 50-shot, take-down model. Adjustable sight!



74th PRIZE

$4.30 BOYCE-MEIER Sextant! The boatman's ideal! No more guessing!



75th PRIZE

$3.35 DELTA POWERlite Dry cell lamp! No wires or oil!

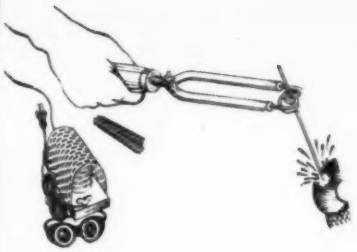
76th PRIZE *HULL $3.25 Streamline Auto Compass! Fits any windshield, any car!*

77th PRIZE

HULL Streamline Marine Compass! For all boats. Polished brass or chrome!

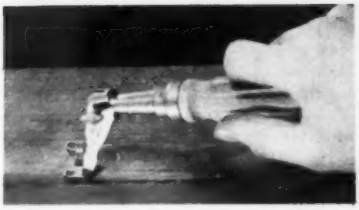
78th PRIZE

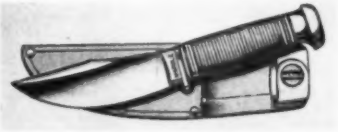
COMET "Interceptor" Gas Model! $2.95 value. Simple construction, sturdy!



79th & 80th PRIZES

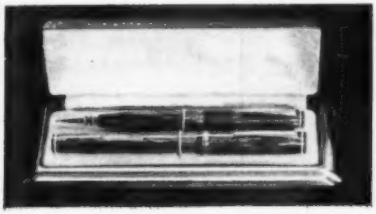
$2.95 HANDI-WELD Electric Welder! AC/DC in 110-volts. Handy, light, portable, rugged construction!





81st PRIZE

VERSITOOL! 5 tools in 1! Worth $2.50. Works as chisel, screw driver, cutting blade, reamer, hacksaw!



82nd PRIZE

MARBLE $2 Sportsman's Knife! With sheath. Sharp as a razor!

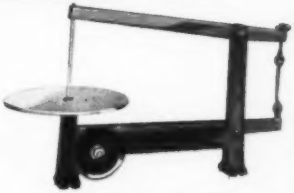
83rd PRIZE *$2 EBERHARD FABER De Luxe Gift Box! Has matching Permapoint Pen and Pencil in set!*

84th PRIZE

ACE Drill Sharpner! For sharpening drills in home workshop quickly!

85th PRIZE

KIRSTEN Radiator-type Cigarette Holder! Value $2! Filters, cleans smoke!



86th, 87th, 88th, 89th, 90th & 91st PRIZES

$2 POLAROID Glare-Proof Day Glasses! Cuts out all reflected glare!

92nd PRIZE *TAYLOR-SHANTZ $1.75 Jig Saw! Hardened steel. Includes adapters!*

93rd PRIZE

$1.25 G-H Lap Table! For reading, writing, drawing, sewing! Also bedside table!

94th PRIZE

COMET "Gull" Model Plane! 42" wingspan! Easy to build and fly!

95th PRIZE

CHRISTY Sport Knife! Smart, practical, useful! Razor steel blade!

96th PRIZE

GRIP-TITE Faucet Repair Set! Set of 10 washers. Will last a lifetime, fit any faucet!

97th PRIZE—*Blueprints for BONNIE, 18' auxiliary sloop!*

98th PRIZE—*Blueprints for TAHITI, 30' ocean cruising ketch!*

99th PRIZE—*Blueprints for PEETEE, 20' power cruiser!*

100th PRIZE—*Blueprints for TANGIERMAN, 32' Chesapeake skipjack!*

DETAILS ON PAGE 76

Here Is The LAST PUZZLE

CONTEST RULES

1. A different "Words Within Words" puzzle appears in each of the February, March and April issues of MECHANIX ILLUSTRATED. The third puzzle appears on the opposite page. The first and second puzzles appear on page 152. Contestants will complete each of the three puzzles, striving to attain the highest score possible and printing this score in the proper space marked "Total" on the entry blanks. The third entry blank contains a space marked "Grand Total" in which is to be written the total number of points accumulated in all three puzzles.
2. The individual having the largest correct "grand total," as printed on the third entry blank, will win first prize. The individual having the second largest correct "grand total" will win second prize, etc. In the event of a tie, the contestant turning in the neatest and most original set of words will be given preference. That is, if two contestants tie for first prize, the neatest entry, and the one showing the most originality in choice of words, will be awarded the airplane, with the second prize going to the tying entry. (Note: Contestants should beware of so-called "lists of prize-winning words," offered for sale. Originality is obviously impossible if such lists are used.)
3. Do not send in entry blanks separately. Send them together by first class mail, to "Words Within Words," Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y.
4. Contestants may submit legible copies of the first two entry blanks as their official entry if they so desire. The third entry blank must be the one clipped from the April issue of MECHANIX ILLUSTRATED. (Note: This is permitted because the contestants may find it possible to secure a larger score after a little practice, and such practice may mess up the original.)
5. Webster's New International Dictionary, Second Edition, will be considered final authority on acceptance of words used in the puzzles. Words appearing anywhere in this dictionary will be acceptable.
6. No entries will be returned, nor can we enter into correspondence regarding this contest. Judges will be the editors of MECHANIX ILLUSTRATED. Their decisions are final. Anyone in the United States or Canada may compete except employees of Fawcett Publications, or members of their families.
7. Neatness, legibility and originality will be considered in judging all entries.
8. This contest closes April 1, 1942. Entries postmarked later will not be considered.

CONTESTANTS!

Would you like to have a chance to win a cash prize, as well as one of the regular contest prizes shown on the preceding pages? If you would, turn to page 150 and see how you can win a Cash Sponsorship Prize merely by telling your friends about MECHANIX ILLUSTRATED'S great "Words-Within-Words" contest!

PAR FOR THIS IS 210

SPECIMEN PUZZLE

									TOTAL
M	A	I	N						4
A	C	T	I	N	G				9
N	U	T							6
U	R	N							7
F	A	I	R						9
A	G	A	I	N					20
C	A	R	T						14
T	R	I	M						15
U	N	I	T						20
R	A	I	N						26
I	N	N							25
N	U	N							25
G	R	I	N						30
								TOTAL	210

In The MI PRIZE CONTEST

HOW TO DO "WORDS-WITHIN-WORDS"

Insert on each horizontal line a single word, of not more than eight letters, the first letter of which is already printed on that line. These letters, already on the puzzle and reading from top to bottom, comprise the KEYWORD. Each word you fill in on horizontal lines must consist of letters appearing in the KEYWORD. Any English word appearing in the Webster's New International Dictionary, Second Edition, may be used, provided no letter appears in your word more often than it appears in the KEYWORD. Example: If "T" appears in the "Keyword" three times, it may not be used more than three times in any one horizontal word. No word may be used more than once in the same diagram. Plurals are permissible.

Method of scoring: Each letter in the finished diagram counts one point the first time it is used, two points the second time it is used, three points the third time, etc. In filling spaces, place letters below and their point value above the curved line as shown in the Specimen Puzzle in the space below. Thus, above the first letter of the KEYWORD put the figure 1. Place 2 above the letter the next time it is used, 3 above it the third time, etc. Your completed diagram will show a score above each letter of each word. Then total all numbers appearing in each horizontal line. The total of these figures is your total for the puzzle.

A par, or average score, is given with each of the three contest puzzles. Do your best to beat par!

A careful study of the "Specimen Puzzle" appearing on the opposite page is recommended, as it illustrates the correct scoring procedure. You can do better than the specimen, however! That's just to give you an idea how it's done.

Puzzle No. 3, below is the last puzzle of the contest. When you have it completed, fill out the coupon below, clip out the puzzle, attach it to Puzzles No. 1 and No. 2 and mail to "Words-Within-Words" Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York City.

PUZZLES NO. 1 AND NO. 2 ARE REPRINTED ON PAGE 152

PAR FOR PUZZLE NO. 3 IS 285

PUZZLE NO. 3

									TOTAL
A									
E									
R									
O									
M									
E									
C									
H									
A									
N									
I									
C									
S									
									TOTAL

GRAND TOTAL FOR PUZZLES 1, 2 & 3.....

NAME .....

ADDRESS .....

CITY..... STATE.....

If you were sponsored in this contest fill out the following. If not, leave these spaces blank.

SPONSOR'S NAME.....

ADDRESS .....

CITY..... STATE.....

When completed, cut this puzzle out and send in with completed Puzzles No. 1 and No. 2.

You're RIGHT — That's WRONG

Here are 25 statements, some of them *true*, the others *false*. The trick is to separate the *true* statements from the *false* ones—and it isn't as easy as it looks! Use a pen or pencil and check the correct box under each statement and see how you make out! After you've given yourself the test, try it out on friends and other members of the family and compare scores. They'll enjoy it and so will you.

Are you ready? Let's go!

1. Airplanes usually take off with the wind as the increased speed gets them into the air more quickly.
   True ☐ False ☐

2. Much oil of wintergreen is in reality birch oil.
   True ☐ False ☐

3. A Portuguese man-of-war is an old type of steam driven submarine, often used in harbor attacks at close range.
   True ☐ False ☐

4. Muscle Shoals are large bulges that frequently develop around the shoulder blades of professional wrestlers.
   True ☐ False ☐

5. An autoclave is not a vehicle but a type of pressure cooker.
   True ☐ False ☐

6. Keel hauling is the term applied to a punishment once used in the Dutch and British navies.
   True ☐ False ☐

7. Charlie Noble is a name applied humorously to the type of depth bombs used on modern destroyers.
   True ☐ False ☐

8. A cable release is an uncensored trans-oceanic message, sent by cable.
   True ☐ False ☐

9. Many bicycle tires carry more air pressure than the tires of a present day sport plane.
   True ☐ False ☐

10. Tank cars carry milk, molasses, and vinegar, as well as oil.
    True ☐ False ☐

11. Many fish are topheavy, and would turn upside down in the water if they had no fins.
    True ☐ False ☐

12. The chief reason why Zebras are not put to work like horses is their natural tendency toward high speed action.
    True ☐ False ☐

13. Although the human body continues to grow in size well into the 'teens, the eyes are full grown at about ten years of age.
    True ☐ False ☐

14. The grease used on submarine fins always leaves a "slick" on the surface some distance behind as the vessel travels submerged.
    True ☐ False ☐

15. The first air mail letter was sent in 1785.
    True ☐ False ☐

16. The greatest known depth of any ocean is found in the Atlantic, one hundred miles west of New York.
    True ☐ False ☐

17. The size of a cow has absolutely no relation to the amount of milk it can produce.
    True ☐ False ☐

18. There is more actual food value in a pound of smoked fish than there is in a pound of fresh fish.
    True ☐ False ☐

19. Human beings consume practically all the cod liver oil and other vitamin-bearing fish oils now produced.
    True ☐ False ☐

20. Although mechanical failure is generally thought of as the greatest hazard to parachute jumpers, the wind is actually the greatest one.
    True ☐ False ☐

21. Most of Bolivia's tin mines, now so important to defense, are located more than a mile below sea level.
    True ☐ False ☐

22. Poison gas was first used in warfare in the sixth century, B. C., by the Spartans.
    True ☐ False ☐

23. All twin engined airliners have engines specially built so that one turns in each direction.
    True ☐ False ☐

24. The newest type propeller shaft cannon used on pursuit planes fires a shell through the engine's crankcase, timed to miss the connecting rods.
    True ☐ False ☐

25. Domes of silence are areas above a radio beam station, in which no signal can be heard.
    True ☐ False ☐

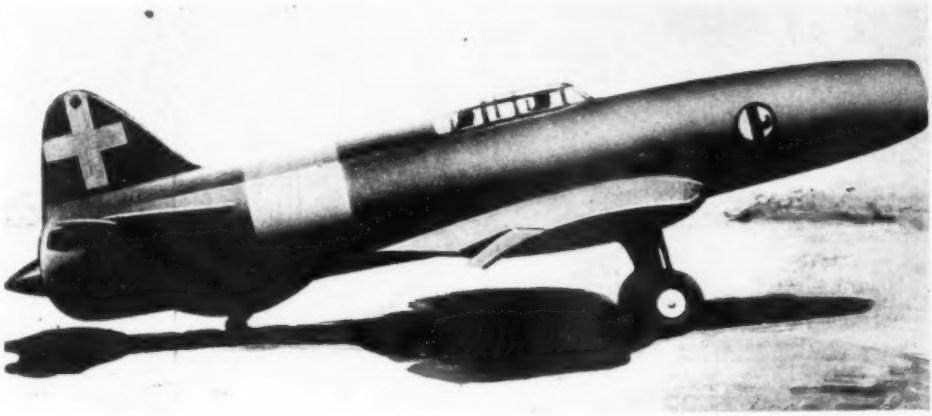
WHAT'S YOUR SCORE?

To get your score simply give yourself 4 points for every question you answer correctly and total the result. If your mark is above 90, you are exceptional; if it is between 80 and 90, you deserve high praise; if it's between 70 and 80, you're good; between 60 and 70, fair; and below 60—well, try again next month!

Answers will be found on page 170

NEWS OF SCIENCE AND MECHANICS

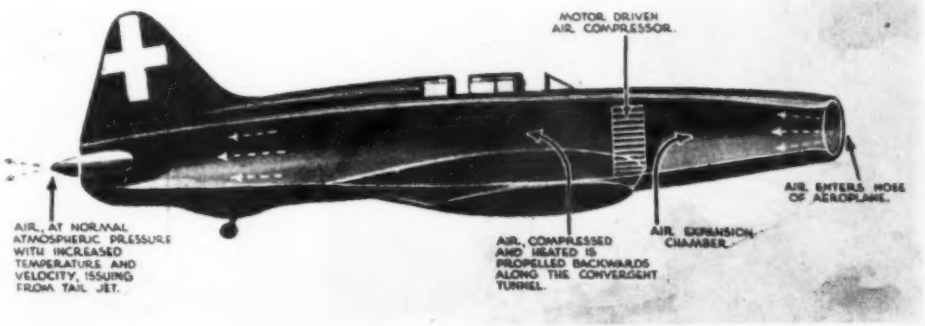
ODD BUBBLE BOAT—
"JUKE-BOX" BUGLER—
NEW STRAFING GUN



Hot Air Drives Propellerless Plane

PROVING that jet-propulsion is no longer a dream but a practical proposition, the Caproni-Campini CC-2 above recently flew 168 miles in Italy at 130 miles an hour in the first cross-country flight of a hot-air-driven aeroplane. No airscrew of any sort is used. Air enters the circular intake in the nose and passes through an expansion chamber where its velocity is reduced and its pressure increased before it enters the motor-driven compressor. This compressor heats the air and propels it backwards, with increased velocity and temperature, into a convergent tunnel. The hot air is finally ejected from the tail. Kinetic energy thus induced gives an extremely powerful thrust. Throttle control is by a cone which enlarges or reduces the area of the outlet.

More data on this revolutionary-type plane will be given in next month's issue.


MOTOR DRIVEN AIR COMPRESSOR.
AIR ENTERS NOSE OF AEROPLANE.
AIR, AT NORMAL ATMOSPHERIC PRESSURE WITH INCREASED TEMPERATURE AND VELOCITY, ISSUING FROM A TAIL JET.
AIR, COMPRESSED AND HEATED IS PROPELLED BACKWARDS ALONG THE CONVERGENT TUNNEL.
AIR EXPANSION CHAMBER.

Holder Now Feeding Baby

BECAUSE Mrs. Carl Silver of Detroit wanted more time to devote to Red Cross knitting, she devised this wire holder for her six-month-old son's bottle. Here he's shown happily drinking his formula without having to call on his mother for aid, thus saving her fifteen minutes she figures she formerly had to spend for the task.

Dan'l Boone: Railroader

FRONTIERSMAN DANIEL BOONE doubtless would shake his head to learn what's occupying his sixth lineal descendant and namesake at Burnsville, N. C., who has built this 300-pound, five-foot model of a Pacific-type locomotive. It contains more than 3,000 parts, runs under its own steam, and took five years to build.

No Gas? Try Using Charcoal-Ammonia

ACUTE shortages of gasoline in Paris, where motor fuel has been commandeered for the German war machine, has resulted in the development of strange-looking automotive vehicles with queer methods of propulsion and power-generation. Among the oddest is the tractor shown above with an elaborate mechanism that obtains power from a combination of charcoal and ammonia.

Portable Traffic Light

THIS portable, automatic traffic signal can be wheeled into position for use where traffic congestion is occasional, as at schools and factories. Operated by a standard six-volt battery with a trickle charger, it can be built for about $100, a fifth of the standard type's cost. But the judge fines you just as much as ever if you don't stop for the red!

Electric Eye Watchman

UNABLE to afford a watchman to turn off lights during blackouts, this factory-owner focused an electric eye on a nearby street light. When the lamp goes out at an air raid warning, the photo cell extinguishes the plant's night lights automatically. At the all-clear, the process is reversed. Saboteurs and thieves are foiled economically!

Trailer Unfolds Into Apartment

THE acme of compactness when awheel, this trailer home unfolds from each side when the owners draw up at a site and decide to stay awhile, and provides an apartment-suite of two rooms and kitchenette, with 380 square feet of floor space. The three main walls take minimum space when closed against the trailer, yet open easily, like a screen. It's welcomed in the semi-permanent trailer cities of defense workers.

At Sea On A Pancake!

APPARENTLY the inspiration for this wacky new boat at Miami, Fla., was a candy wafer, a pancake, or flat bubble. It can be carried atop a car, and will skip across the water like a tossed flat stone. Framed on a circular steel tube, the bubble boat is covered with rubberized canvas and contains two air compartments which are easily inflated once the shore is reached. The motor is clamped to a board secured to boat by bolts set in the frame just for this purpose.

Flying Wing Mock-up Given Ground Tests

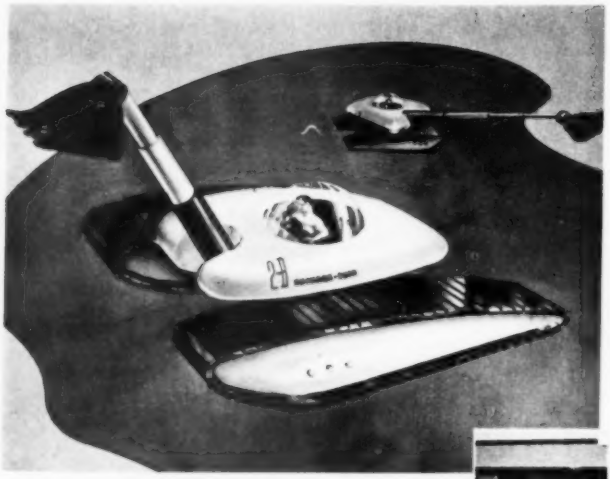
IN PINT-SIZE form, another flying wing airplane, this one designed by Cheston Eshelman (pointing to cockpit), was given final ground tests at Baltimore, Md., recently. On tests on the experimental mock-up shown here depended construction of a larger ship which would be offered to the Navy as a carrier-borne fighter. The mock-up is built from plane designs in such a way that changes can be made easily and quickly.

Tin Cans Now Salvaged

DISCOVERY of the first successful tin-can salvaging process coincident with the capture of Malaya's great tin smelters by the Japanese is of vital importance to our defense. With magnetic belts, required metal is separated from non-metallic debris (left). Cans are shredded and metal separated, tin is dissolved under pressure with a hot chemical solution. It's then electrolytically deposited 1 in. thick on iron rolls, from which it's cut, melted into pigs of pure tin (above).

Factory Protection Begins At The Top

DISABLING accidents in aircraft factories are now avoided thus: (l. to r.) spray painter wears a special nosemask; plant firefighter has on an asbestos suit; the "cold room" research man wears deep-sea diver-like headgear and leather garments; the sandblaster dons a dust-proof mask, heavy apron, and gloves; the welder wears an eye-protecting mask; the jigman wears a crash-proof military helmet against dropped tools.



Power Shovel Model Offers Full Vision

RECENTLY designed but not yet in production, this Diesel shovel has a body of colored molded plastic, and dome of clear, unbreakable plastic to give the operator full vision. Excavating is speeded with a lightweight tubular steel boom, telescoping to give faster action and greater range. Two huge tractor treads operate independently of each other.

Students Build Stretchers

DEMONSTRATING the aid a school shop can be in local defense efforts, 88 students in woodworking classes at Galileo High school, San Francisco, turned out 400 specially-designed wood and canvas stretchers to relieve a shortage of first aid equipment. Working only one hour a day, the youths took only eight days for the project. Here are two of the group checking off four more of the completed stretchers. The accomplishment showed how even the manual trades can helpfully turn to mass production on demand.

New Giant Plane Has Longest Range

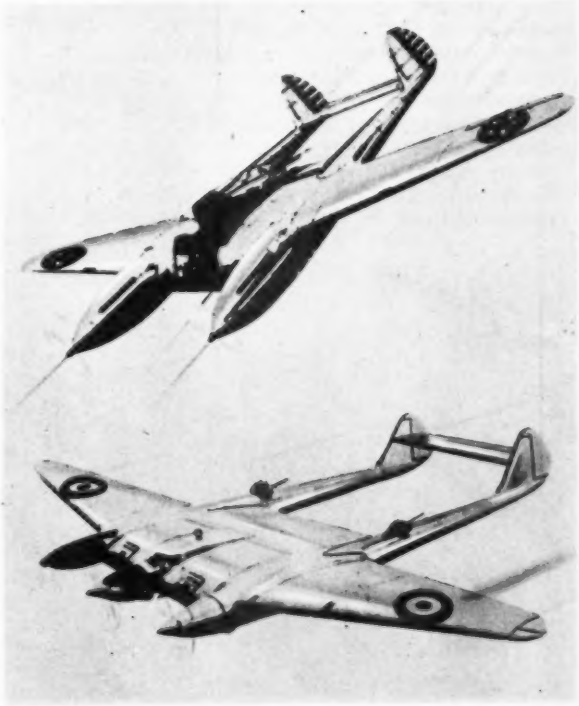
AT THE sponsoring ceremony at the Stratford, Conn., plant where it was recently completed, Mrs. Henry A. Wallace christened the world's longest-range commercial aircraft with the name *Excalibur*. It's the first of an entire fleet of "Flying Aces" which are to fly transoceanic schedules non-stop from American sea-plane bases.

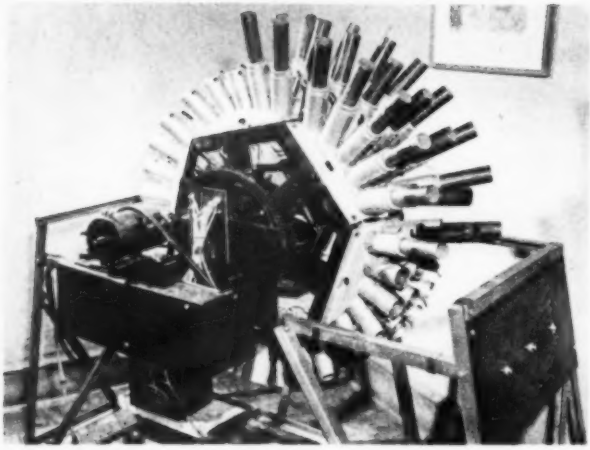
Navy Glider Is Big As An Airliner

TWELVE men will be accommodated in the new amphibious glider being ordered for the United States Navy's use in war strategy. Even though as large as an airliner, the motorless plane, shown above in an artist's conception, can land as slowly as 20 m.p.h.

Fighter, Bomber Use Flying Wing Idea

THE "flying wing" idea is adapted to a twin-engine fighter (top, right) and a heavy bomber (bottom) in these drawings of advanced warplane designs by Vincent J. Burnelli, pioneer aviation designer. Note thickness of the central section of the wing, and the machine gun turrets atop the bomber's long booms running aft to the tail. These may be next year's models!





Strafing Gun Can Wipe Out Squadron

A SINGLE high-flying plane can wipe out an entire squadron on the ground below with this new multi-barrelled aerial strafing gun. It is electrically - operated and fired, won't jam, and will fire 15 shots with a single button-push; it has a full charge of 90 shells. Flares—it's said to offer a more perfect flare system than any other ever used—solid shot, gas shells, or shrapnel may be used. A novice can operate it.

Turnpike Traffic Includes Bomber

FORCED to land in a storm, this army bomber's pilot luckily was near the Pennsylvania Turnpike between Harrisburg and Pittsburgh. The highway, which arrows between the two cities on a former railroad bed, was designed for emergency plane use, but this case is the first time its broad surface has been used by a bomber. Here it's roaring along the morning after the storm for a safe take-off—and no toll paid, we'll bet.

Biggest Mobile Gun Finished

WEIGHING more than 100 tons, this 240-mm. howitzer was recently completed for the U. S. Army at Milwaukee, Wis. It's now the army's biggest mobile field piece. The 27-foot long barrel is shown here on a trailer behind a truck as it left Milwaukee for the proving grounds at Aberdeen, Md., going by way of New York City. It was guarded by a special convoy of army troops for protection.

P-40s

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P-40s Rule African Sky

AUSTRALIANS piloting American Tomahawks are now "the most efficient fighters in the history of air combat," averaging 18 enemy planes for one of their own lost. R.A.F. camouflage artists have made the planes as terrifying to the enemy in appearance as their record, turning them with brilliant paints into "winged sharks" (see cover). The Tomahawk engine's cooling area has made it effective over Africa's deserts.

British Use "Stiletto"

A NEW type of bayonet like a stiletto is being issued to British troops. One is shown above on the gun of the Tommy at right; in contrast is the old type of bayonet on the gun at left. Only six inches long, compared to the 16½-in. older one, the new bayonet has a needle point and can be used without a rifle in close-quarter fighting. It recognizes the importance of hand-to-hand fighting in this "war of machines."

Nazi Bomber Has Bumper

TO COPE with balloon barrage cables, Nazi bombers have been fitted with bumpers like the one on this Heinkel recently brought down in Great Britain. The device cuts cables attached to the balloons without damage to the propeller, but the added weight of the bumper reduces speed and bomb load.

Fighting Subs Or Sub-Zero

SEAMAN HAROLD LINDQUIST looks like a character out of a Captain Marvel adventure in this fantastic garb, but it's just sensibly heavy and thorough protection against cold weather. On the top deck of the *Eagle 57*, flagship of the inshore patrol that keeps an eye on events in and around Puget Sound, he's insulated against icy winds of the early spring off the Pacific.

Defense Sounds A New Note

FUNDS for America's victory effort roll in musically with this combination juke box and girl defense-stamp dispensers. A. J. Jordan, left, plugs a quarter into the patriotically-lighted automatic phonograph, and then to the tune of a selection like the national anthem or "Anchors Aweigh" he receives a 25-cent defense stamp from one of the lovely young helpers at the right.

When It Squeals You Head For Shelter

THAT annoying static howl that occasionally emanates from your radio may soon be put to helpful, perhaps life-saving, use as an air-raid warning. Carol E. Keeler, former Oregon highway patrolman, suggests that a small machine, such as he is shown manipulating here, can be built from an automobile radio to produce a distinctive sound over the radio that motorists will recognize as a warning of bombers.

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Little Men Have A Big Place In Plane Building

ONE hardship of plane manufacture was the cramping space in which men inside the wings and fuselages had to work.

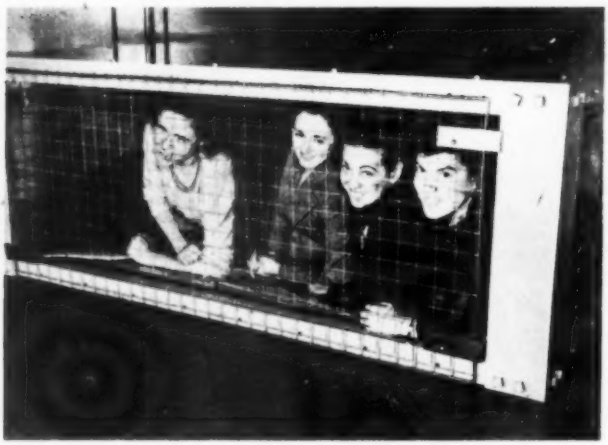
But midgets met the situation perfectly and wasteful extra "times out" ended. Left. John Giovanco (4 ft.; 88 lbs.) "bucks up" a rivet in the wing of a Brewster fighter; right, Earl Wallace (4½ ft.; 90 lbs.) looks aloft to a co-worker, Gordon Morrison, 6 ft. 10 in., at the Lockheed factory.

Captured Tank Serves Hospital

BUT the hospital is for damaged tanks, rather than for wounded soldiers! Tanks put out of action during a battle are collected by recovery units and dragged to the rear of the scene for repairs. Often, quick work by recovery crews enables damaged tanks to return to battle lines in a few days. In the photo a German tractor captured by the British forces in the Libyan advance hauls a damaged British tank.

Strange Jap "Death's Head"

THE peculiar device above which, upon examination, bears some resemblance to a skull, is the front end of the Japanese two-man submarine blown up and washed ashore at Pearl Harbor, Hawaii. It is made up of a razor-edged outrigger device designed to cut through submarine nets, and the heads of two loaded torpedoes thrust out of their tubes, ready for firing. Smaller picture at right shows a view of the entire submarine.



Peek-A-Boo Cage Is Home Air Raid Shelter

THOUGH it resembles a chicken coop, the contraption at left is an air raid shelter to be used in the home. Constructed with steel top and steel slats on bottom, the shelter's chief purpose is to protect occupants from flying debris and falling beams and bricks. It will support a load of 35 tons, according to its makers, and will sell for approximately $100. Two can sleep in it.

Now Tires Are Branded!

WITH automobile tires disappearing from the scene, someone has suggested that tire thieves should now be lynched, the same as horse thieves were lynched in frontier days. To make the analogy closer, motorists are now branding their tires to protect against theft, as horses are branded in the West. Above, the brand is shown, and at left is the inventor of a tire brander, George Eberhardt, Chicago, displaying an electric brander.

Fastest Fighters In Mass Production

THE fastest fighter plane in the world, the Republic *Thunderbolt*, has been placed in mass production, the O E P reports. Termed the P-47, the plane has attained a diving speed of 680 miles per hour and in level flight a pace of more than 400 miles per hour. It has an engine of 2,000 h.p., a four-bladed propeller, length of 32 feet and a 41-foot wingspread.

Army Buglers Adapt Juke-Box Technique

SOLDIERS who look to mechanical phonographs with amplifiers, "juke boxes," only for entertainment and relaxing sound have been betrayed! For now the army bugler, at Fort Belvoir, Va., anyway, just puts on a record (above) and through the eight amplifiers (right) comes sleep-shattering reville. The "bugler" has to be on duty 24 hours a day but has a library of records for every call in the day's routine—plus an air-raid alarm. His headquarters are in a small building at the foot of the amplifiers' tower where the phonograph turn-table is located.

Aero Dirigible May Be Plane Tender

AIR war may result in adoption of aircraft tenders like this model of a new semi-aero dirigible. The ship would be 150 feet long, with a 75-ft. wingspread. The helium-filled dirigible overcomes plane-plus-fuel weight, the wings and engine provide lift, and control ascent and descent. It could supply other aircraft with fuel, bombs and other war supplies, or serve as a hospital ship.

CRAFTS AND HOBBIES

PHOTOGRAPHY
MODELS • RADIO
HOW-TO-BUILD
WOODWORKING

Photographic Book Marks

by Louis Hochman

THE well-read amateur knows that a book mark is an indispensable aid to the literate individual. It holds his place for him when he takes leave of his reading, and saves him time and annoyance when he gets back to it again.

Book marks can be made from practically anything that will fit between the volume's pages, but why not be imaginative and put photography to work on this problem? Photographic book marks can add that elusive personal touch. They will be more than mere place holders.

Many photographs are suitable for photographic book marks: portraits, animals, babies, children, still life, etc., can all be adapted. The accompanying illustrations are but a few suggestions.

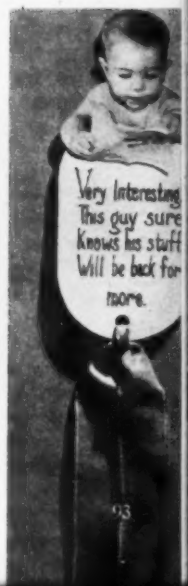
Materials that may be used for the place-holders include heavy drawing paper, patterned fabrics, lace, ribbon, soft leather or imitation leather, etc. The lettering method will depend upon the material.

In the case of leather, you can inscribe it with gold lettering by using an inexpensive "Electro Pencil." This is sold with a quantity of gold-leaf paper for gold writing on any surface. If fabric materials are used, you can sew the lettering in with colored thread using a sewing machine set for a small stitch, and working it slowly by hand; the lettering may also be done with India ink or any desired color.

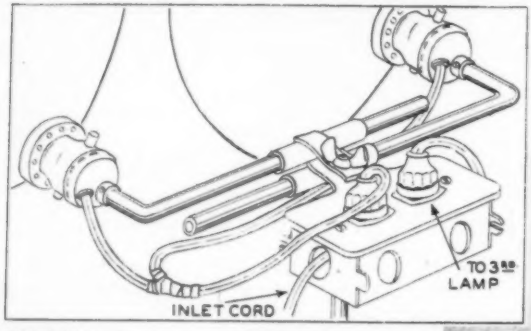
[*Continued on page* 175]

Top: Cut-out book mark in use, with leather tail (the dog's) protruding. Above: Photo glued to soft leather—gold lettering done with electro Pencil. Right: Picture glued to eggshell paper. The letter is lettered in ink.

Above: *This is how gold-leaf paper is applied to the book mark material with the Electro Pencil. It's best suited for working with leather.*

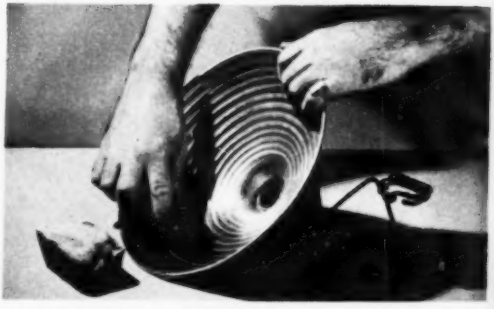


Kinks For Photo Amateurs



HANDY OUTLET BOX. Operation of the standard twin flood lamp unit can be facilitated by attaching a shallow double-socket outlet box to the stand, as shown below. Cords from the two reflector sockets are shortened and spliced as in the diagram and the single joined wire plugged into one of the outlets in the box; the other outlet can take the cord from a third reflector.—Howard R. Heydorf.

Above: *Photographers who often fail to pull the film pack adapter or cut film holder slide before exposing can prod their memories by drilling a hole in the center of the tip end of the slide and attaching a red ribbon there. Red flag—DANGER! Pull that slide!*—Mildred Hatry.



Above: *The efficiency of dull aluminum reflectors can be increased by occasionally polishing them to a bright sheen. Touch a pad of fine steel wool to a cake of metal buffing compound and apply briskly to reflector surface. To preserve the bright finish, wipe with clean cloth and apply clear fingernail polish.*—Kenneth Murray.

CHEMICAL WEIGHING AID (above and right): Weighing can be simplified by making up a set of 3x4-inch formula envelopes (glassine or cellophane)—one for each chemical in the formula. Mark the outside of each with the formula number, the name of the chemical, and the quantity required. Place envelopes in the order of solution and weigh the required amount of chemical into each using the water quantity envelope as a counter-balance. Place envelopes in order before dissolving the contents of each to avoid confusion in use.—Lester Lehnherr.

PHOTO CONTEST

FIRST PRIZE ($10.00): "Worthy Dreams" by Lionel F. Beaudoin, Rectory, Van Buren, Maine. SECOND PRIZE ($5.00): by Mrs. Allen L. Sutter, 1111 Greenwich Street, San Francisco, Calif. THIRD PRIZE ($4.00): "Fire Chief" by T. J. Murden, P.O. Box 683, West Palm Beach, Fla. Taken with a Leica camera, Summar 50mm lens, on Agfa Supreme film at f/6.3, 1/200th second—hazy day. FOURTH PRIZE ($3.00): by Leonard Becker, 5224 Gainor Road, Philadelphia, Pa.

Another contest this month—another chance for YOU to win one of the four cash prizes offered. Prints must be unmounted—no larger than 8x10 inches. Write your full NAME and ADDRESS on the back of each print and wrap securely with cardboard or corrugated stiffeners. With each print, list your camera, film, lens opening and shutter speed, illumination, and developer. If you want unused prints returned you must enclose return postage. (Published prints cannot be returned.) Address: Photography Editor MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y.

1st Prize

2nd Prize

3rd Prize

4th Prize

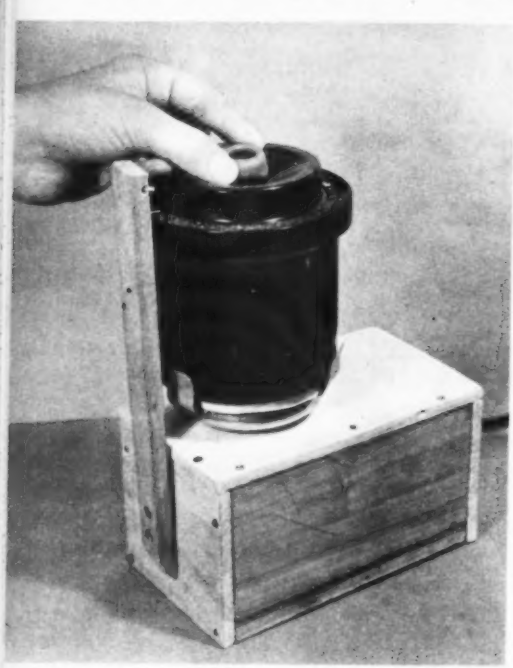
ELECTRIC TANK AGITATOR

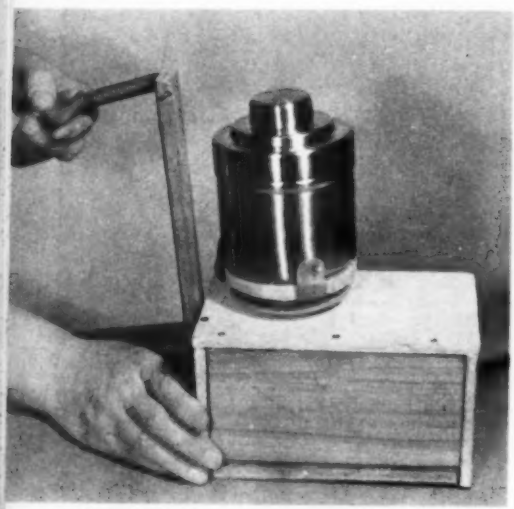
by Frank Caporael

IT IS hardly necessary to point out the necessity of agitation in tank development of films. There are numerous methods of agitation, both mechanical and manual. The electric agitator described here will prove a boon inasmuch as it is inexpensive to build and requires no more attention than to plug the wire into an electric light outlet to turn it on. A few household tools will suffice for its construction.

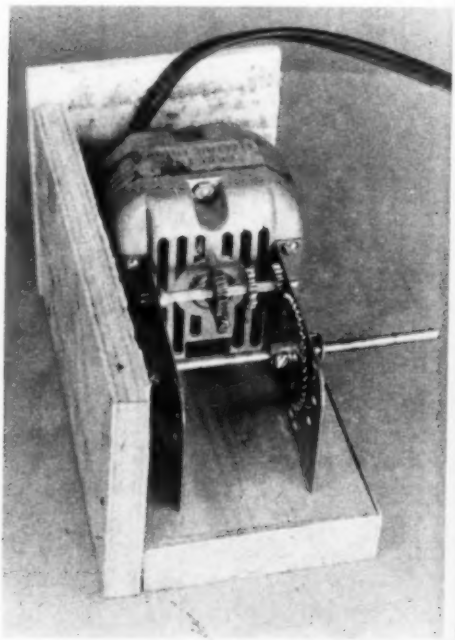
The mechanical parts for this agitator were salvaged from a discarded Erector set. If you are not fortunate enough to have a grown boy who has lost interest in this childhood mechanism, you may purchase the parts separately or obtain others similar to them.

For compactness, a small motor is necessary. The power of the motor is not so important, as the load will not be very great at any time. It will be noticed that the shaft upon which the tank is designed to rest is geared to the shaft of the motor by medium ratio gears. This arrangement affords a



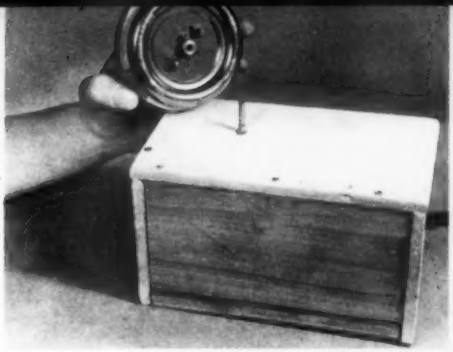


The electric agitator may be used either with tanks equipped with a pouring baffle and agitator key (top) or those that are completely closed. In the case of the latter, the platform's revolution swirls the solution in the tank; the wire arm is swung out of the way (above). Otherwise the rubber-covered wire arm is placed so it grips the agitation key snugly (top). As the platform and tank housing turn, with the motor, the key holds the reel inside of the tank steady, thereby causing irregular movement of the tank solution adjacent to the film.



Notice how the motor is placed sideways in relation to the platform shaft; use of a heavy wooden base for the motor keeps the apparatus from "floating" when it is used.

Holes are drilled through tank platform and metal wheel to take machine screws; galvanized clips, sandwiched as shown.



The entire unit is assembled here except for revolving platform which is secured to the shaft by the set-screw collar.

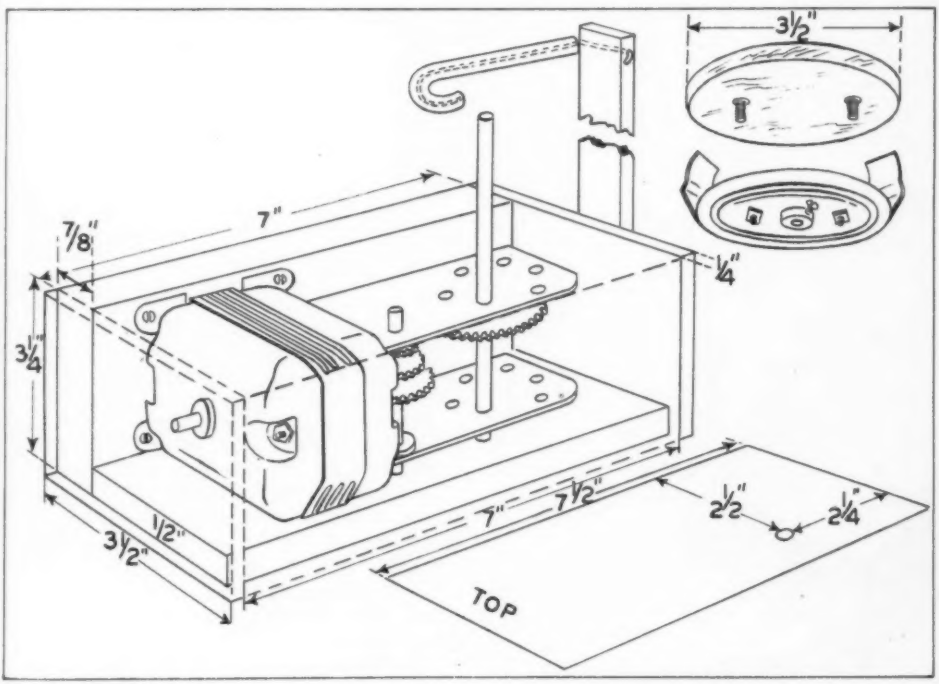
maximum of power for the motor size.

After selecting the motor and suitable gears for the assembly, begin the actual construction. First, attach the motor firmly to a strong, hardwood base. Make sure that there is sufficient clearance, so that none of the motive parts bind.

The dimensions for building the cabinet around the motor are contained in the drawing. The platform which holds the tank is a piece of wood bolted to a wheel from the same source as the motor and the motive parts. Counter-sink the holes so that the screw heads will be flush, or below the surface. The three pieces holding the tank on the platform are cut from galvanized sheet. They may be attached to the wooden platform with wood screws or held in place by tension between the wheel and the wooden platform.

The extended arm, which is provided to hold the agitating key of the developing tank is merely a piece of wire with some rubber tubing loosely slipped over it. The loop

[*Continued on page* 173]



These are dimensions for the electric agitator illustrated in this story. Note the placement of the motor in the housing. Use of a tank with appreciably greater diameter than 3½ inches requires a larger platform and different shaft position.

Shoot Your Pi

FIG. A (right): This little member of the lizard family was originally photographed on No. 1 Velour Black paper by the light of three No. 2 floods at f/4.5 and 1/10th second. The original paper negative is at the upper right corner of this page. It was rephotographed, wet, as shown above on No. 2 Velour Black paper by the light of one No. 2 flood—f/8 at one second.

by Roy Lester

TAKING pictures without film is a simple matter when you know how. In fact, you may not realize it but that is exactly what you do every time you make an enlargement in your darkroom. In reality, your enlarger is nothing more than a camera, shooting an extreme closeup of a negative and using bromide paper instead of film!

If you can use bromide paper with your enlarger, why not use it in your camera too? True, paper is much slower than film, but if you make a few tests with it, you will find that instantaneous exposures of from 1/10 to 1/25 second at f/4.5 in sunlight, and from 1/10 to 1 second by the light of a few No. 2 flood bulbs, will result in fully-exposed paper negatives that will yield good contact prints. The approximate Weston speed rating of fast bromide paper are: Daylight—6, and Tungsten—3.

Taking pictures on paper is just as easy as taking them on film and in a number of instances, paper will prove more useful and considerably more economical. One distinct

FIG. B. This is how bromide paper, cut to the exact size of the cut film adapter, is placed in the camera plate holder.

Pictures On Bromide!

FIG. C. One No. 21 flash at 45 inches, and synchronized at f/3.6 and 1/50th produced this negative on Velour Black No. 2.

advantage it offers is the ease with which it can be handled and developed. The paper develops out in from one to three minutes, depending upon the concentration of the developer, and it can be handled throughout by the bright, yellow-green light of an OA-type safelight. The resulting paper negatives can be retouched very readily. Just apply a soft, black pencil to the back of the paper over a suitable trans-illuminating arrangement (any window pane looking out into daylight will do too).

Since average outdoor subject matter is quite contrasty, you will get the best possible tonal gradations by using the softest grade of paper in your camera, and exposing accurately. Paper is extremely color blind to the colors at the red end of the spectrum and it is a good idea to avoid subjects that dominate in those colors. However, as can be seen in Figure D, a light yellow filter can be used outdoors to deepen the sky tones and bring out the clouds. [*Next page please*]

FIG. D (above): Exposed by light of 1 p.m. sun on Kodabrom F-1 at f/4.5, 1/10th second through a light yellow filter. The graininess resulting from contact printing is pleasing.

FIG. E (right): Portrait paper negative is cut away from a spotty background and rephotographed on a matte black cardboard so final paper positive will have a white background.

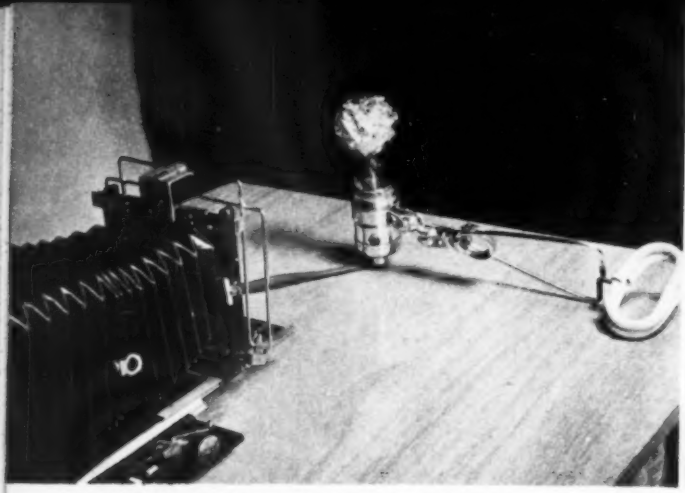


FIG. F (left above): Photographing flash lamp synchronization on paper to determine whether the shutter timing is adjusted for the lamp time-lag. FIG. G (above right): Test result showing perfect synchronization: the entire lamp is aglow.

FIG. H (above left): Original paper negative of manuscript copied by method. FIG. J (above right): Resulting positive.

Contact printing the paper negative will result in a reproduction of the paper grain in the finished print, which often has a pleasing texture effect in pictorial pictures as in the case of Figure D. However, if you want to avoid this paper grain texture, you can simply take your paper negative right from the hypo, slap it against the wall wet, and make another photograph of it on paper. The result, when developed, will be a perfect positive print that will be hard to tell apart from one taken on film. With this process, you can take a portrait on paper, develop and fix the paper negative in five minutes, copy it on paper, and develop the finished positive print in another 5 minutes. Thus, it becomes possible to show a finished print in from 10 to 15 minutes, with all developing done in the comfortable, bright light of a series OA safelight!

Figure A is the result of placing a sheet of bromide paper in the camera and photographing a live lizard on it. With three No. 2 floodbulbs, the exposure was made at 1/10

[*Continued on page* 151]

Flag Initials For Your Car

SHIPS often talk to each other by means of flags of the International Code of Signals, there being one flag for each letter of the alphabet. By making miniature replicas of the proper flags, you can put your initials on the door or other part of your automobile in a colorful and attractive manner. In addition, you will be learning the flag code in an easy and enjoyable manner. Knowledge of this code may prove invaluable before the war is over, particularly if you are, or will be, engaged in civilian or military defense. Colors appearing on the various signal flags include white, black, and bright blue, red and yellow.

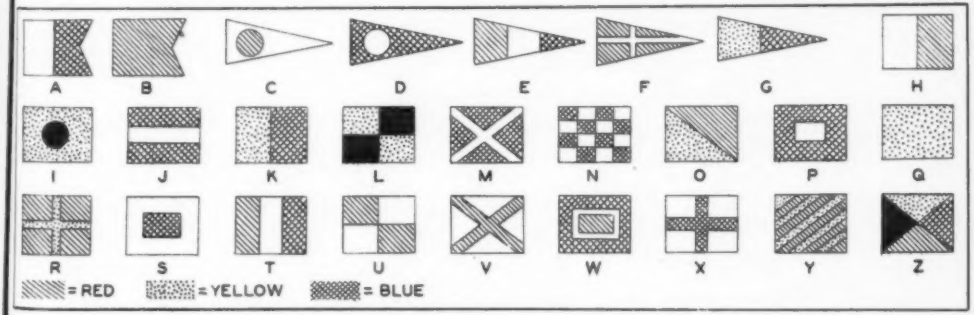
On tough white paper such as the back of a discarded photographic print, draw the flags representing your initials or name. An appropriate size for rectangular flags is $\frac{13}{32}$"x½"; and for pennants, $\frac{9}{32}$"x$\frac{25}{32}$". Outline the flags with black India ink, and then color them with ordinary water colors or with colored drawing ink. Trim the flag series to form a strip about $\frac{1}{16}$" wider than the widest flag. Allow the same margin at one end, but leave temporarily about 1½" of paper attached to the other end. This permits easy handling while the strip is dipped into clear brushing or spraying lacquer or varnish until the colored design is completely covered. Place the paper strip with the flag-end up to drain and dry. Trim off the extra paper, and touch the cut end with lacquer or varnish to seal it. This treatment waterproofs the design.

[*Continued on page 159*]

Coloring hand-drawn flag design with ordinary water-mixed paints. Initials are W. E. B.

Dipping design strip into clear lacquer to waterproof it and provide wear-resisting surface.

Washing away excess weather-strip cement after initials have been applied to automobile door.



Flags of the International Code of Signals. There is one flag for each letter, with colors as indicated by shading and explained in the key. It shouldn't take you long to learn them all by heart.

Beat The Weatherman With This

The instrument looks professional and compares favorably with mercurial barometers costing $18 or more. By keeping a continuous record of the readings it is possible to arrive at surprisingly accurate local weather forecasts.

The war has necessitated a censorship over weather reports, but you can make reasonably accurate predictions for your own enjoyment and benefit with the aid of this barometer.

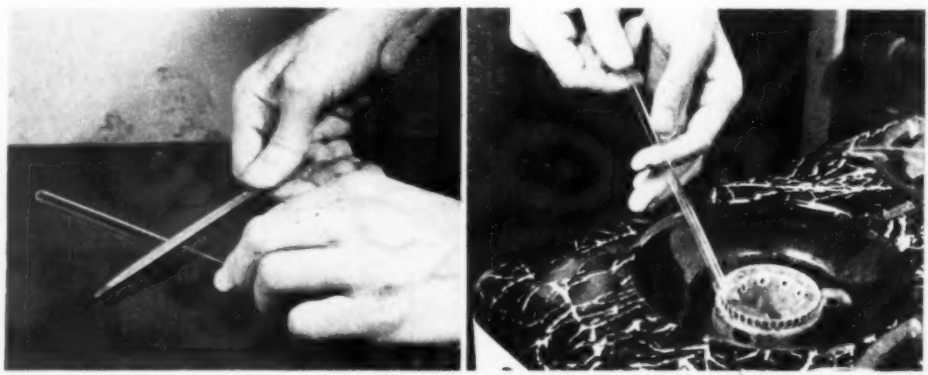
by
Chas. and Bertram Brownold

FINE mercurial barometers are very costly instruments. They range in price from $18 for the kind known as the "class-room type" to $165 for the "observatory type." Yet it is possible to make one of material which is easily obtainable, at a cost that will not exceed four or five dollars, and with the expenditure of very little time and labor.

Of course, the barometer made by the amateur craftsman will not lend itself to the fine adjustments and delicate corrections of the precision-built observatory type, nevertheless it can be made a practical and accurate instrument.

Mercurial barometers of the type here described make use of the following fact: If a glass tube longer than thirty inches, with one sealed end is filled with mercury, and if the tube is then inverted with its open end immersed in a receptacle also filled with mercury, normal atmospheric pressure at sea level will support the column of mercury in the tube at a height of slightly less than thirty inches, measuring from the surface of the mercury in the receptacle.

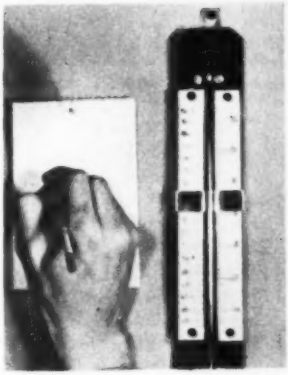
The mercury in the tube will rise and fall



How the glass tube is treated. Left: Cutting it to length by scoring with a file, then snapping off. Right: End is sealed over flame.

Mercurial Barometer

Above: Any dust or other impurities in the mercury can be removed by straining it through a clean chamois.



Right: The gauges are calibrated in inches on one side and centimeters on the other; Normal-weather reading at sea level will be slightly below 30-in. mark. Note sliding indicator.

Pouring the mercury into the glass tube. All air, including even the tiniest bubbles, must be removed by light tapping.

with changes in atmospheric pressure, and to build a barometer, all that is necessary is the addition of certain simple accessories to facilitate the reading and the interpretation of these fluctuations, which then form the bases for predictions as to weather conditions.

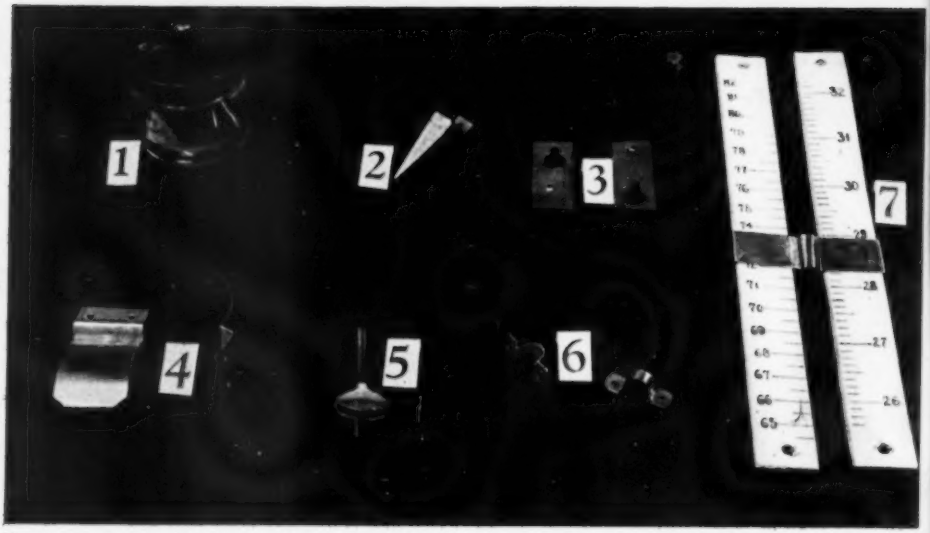
Here is a list of what is needed:

A BACKBOARD—This is a piece of hardwood 36″ long, 2″ wide and about ½″ thick. Cut a groove or recess in one end of it, 3″ long, 1½″ wide and ¼″ deep. At the same end fasten a shelf of hardwood 2″x2″. Paint backboard and shelf black so that when the gleaming mercury is in place it will stand out well by contrast and so be easily read.

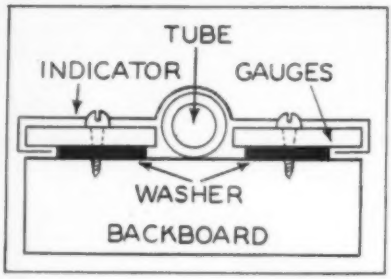
A GLASS TUBE—This should be about 32″ long with an inside diameter of about ¼″. Such a tube can be bought at most large drug stores and at laboratory supply houses. In case the tubes carried by the store are longer than required, it is easy to cut off the superfluous length. Simply score the surface of the glass with a fine file at the correct place and the tube can then be snapped off cleanly.

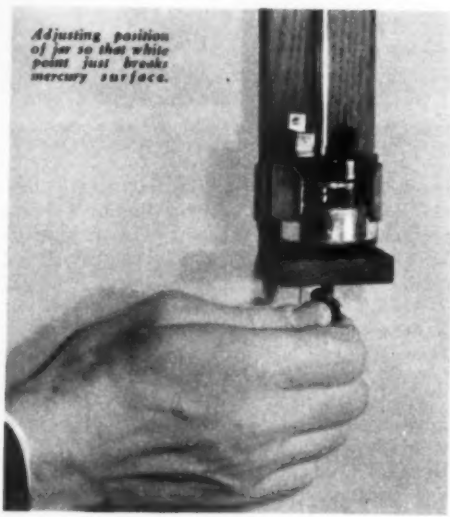
Next, close one end of the tube by holding it in an ordinary gas flame and turning it. Revolve it rapidly at first and then more slowly as the glass softens.

A CLEAR GLASS JAR—The jar should have a metal screw top and should be the kind druggists use for dispensing ointments and salves. A jar 2″ in outside diameter and 2″ deep will do. Drill a hole in the metal cover large enough to admit the glass tube in a loose fit. The hole must be placed so that when the jar is standing on the shelf of the backboard with its cover on, the tube fastened flat to the backboard, will slip into



Various parts used in the barometer: 1. Clear glass jar. 2. White point. 3. Wall catches. 4. Clamps for jar. 5. Thumb screw. 6. Pipe straps. 7. Gauges and sliding indicator. Drawing below shows how indicator and gauges fasten to backboard.





the hole easily. When the jar is on the shelf it is pushed into the recess which has been cut in the backboard to receive it. The purpose of the recess is to allow for the thickness of the jar wall.

WHITE POINT—This should be about 1½" long. The material may be white celluloid or bone or ivory, and an old knife handle or discarded comb might supply the small piece needed. Or a piece of white bone or plastic knitting needle might be used. In no case use metal because the point will be in contact with the mercury which has a tendency to amalgamate with other metals. And white instead of a dark color is advocated because the tapered end of the point will be inside the jar and must be easily visible from without.

After the point has been cut and shaped, make a small bracket with which to fasten the point to the backboard. The photo of small parts shows the point riveted to its bracket.

WALL CATCHES—These are of brass and are fastened to the back of the backboard at top and at bottom. Each has a slotted hole large enough to fit over a round head wood screw. The wall catches make it possible to remove the barometer from the wall without jarring or shaking.

CLAMPS FOR JAR—These are of sheet metal and are fastened to the sides of the backboard. They hold the jar on the shelf and press it firmly into the recess.

THUMB SCREW—These are obtainable at

[*Continued on page 171*]

THE "PR" RECEIVER

Part II — Adding Loudspeaker

The speaker carries plenty of volume, and excellent tone can be obtained by using a large baffle. The baffle shown here is 5-ply plywood, ½" in thickness.

THOSE of you who have built the "Progressive Regenerative Receiver" described in last month's MECHANIX ILLUSTRATED probably have callouses on your ears by this time from listening in over long periods of time. We know you have used the set a lot because we have received many favorable reports from our readers who have built the unit.

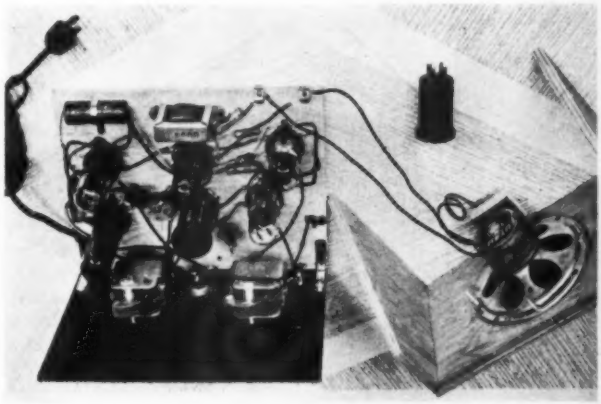
This month's installment shows you how to add additional amplification and a power tube for operating a loudspeaker. These changes are simple and the expense is small. You will be amazed at the fine loudspeaker results you can obtain with this unit.

The front panel now has one additional control—a potentiometer for controlling the volume. Although the regeneration control acts as an excellent volume control there are certain advantages to having a separate volume control as we will explain later.

All of the parts used in the headphone version last month are used again with the exception of one of the ballast tubes. Since these tubes cost only 10c each, this is not much of a loss. Two tubes and a few additional condensers and resistors, plus, of course, the speaker and output transformer must be purchased.

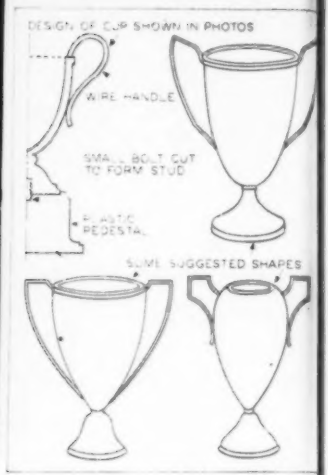
One of the 6J5GT tubes which was used as a rectifier in the headphone version of this receiver is now converted into an audio amplifier. This tube is followed by a 25L6GT which is a beam power output tube and will deliver plenty of power to the speaker. Now that a power tube of this kind has been added,

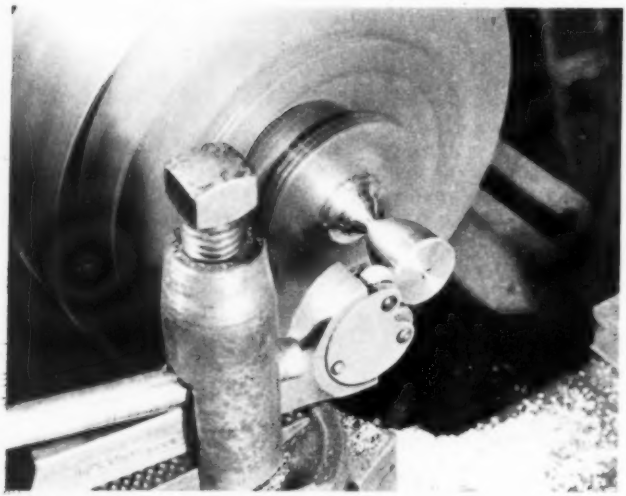
[*Continued on page* 130]



Two extra tubes, an output transformer and a few additional smaller parts are needed to add the speaker hookup. Any size speaker from 2" to 12" may be used. The one shown at right is a 5" job. Study photo carefully.

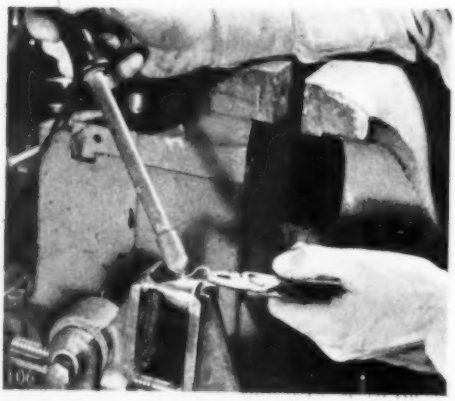
Lathe-Turned Trophies





Sketch above shows some suggested shapes for the cups, and also method of attaching trophy to base. Left: Knurling decorative rim on cup in lathe. Only one of the two knurling cutters is touching work in order to produce a parallel line design. Lower: Soldering brass-rod handle to cup.

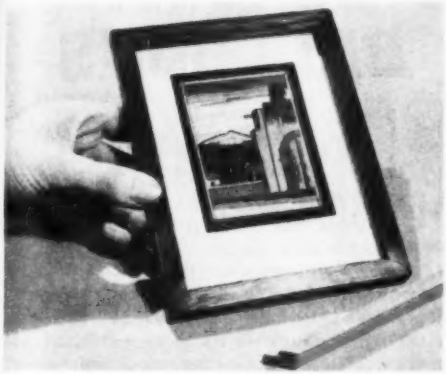
MINIATURE loving cups are popular as trophies in club contests, pistol and rifle shoots, photographic competitions, and school events. And they are highly prized as what-not ornaments that have no connection with anything in particular. The making of such a midget cup, one with a genuine silver finish, is a fascinating and inexpensive project for the workshop lathe.



A cup 1¾" high exclusive of its pedestal, and about 1" in diameter is a satisfactory miniature size. First lay out the pattern on paper or cardboard and, if you wish, cut it to form a template. Chuck a length of round brass bar of sufficient diameter, and machine the cup to shape. Finish the surface by filing, followed by treatment with steel wool or very fine abrasive cloth. Finally polish with a little fine abrasive or polishing powder on an oil-moistened cloth. Bore out the cup to make it hollow. A pleasing decorative touch is produced by knurling the rim lightly, using either one

[*Continued on page* 175]

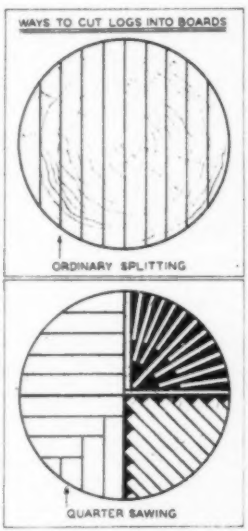
Sawing Boards From Logs



by Walter E. Burton

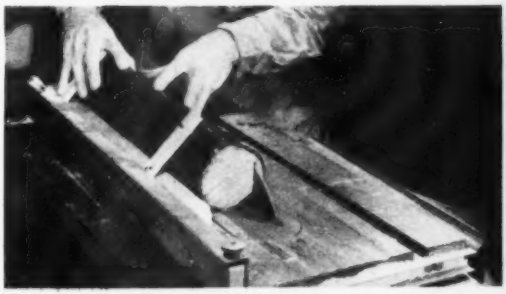
IN THESE days of advancing lumber prices it often pays the workshop owner to go all the way back to the tree for his supply of material for small projects. It is not difficult to cut boards and strips from small tree trunks and fair-sized branches with a circular saw or band saw. Wood that has seasoned for several months or years should be used when possible.

A miniature log 3" to 5" in diameter can be squared up and then ripped into boards or strips with an 8" circular saw by making two passes for the deeper cuts; and with the band saw, preferably equipped with a wide blade, in one pass for each cut.



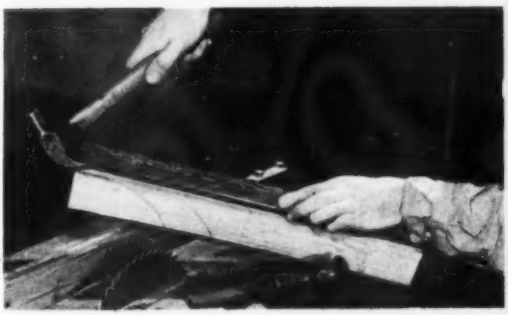
First step is to flatten one side of the log. Place a strip of wood measuring about 1"x2" parallel to the log and quite close to it, and nail shorter strips to connect the two as shown. This strip acts as a straight-edge that slides along the

[*Continued on page* 177]

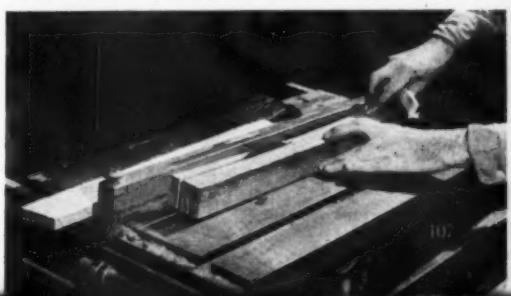


Taking first cut to remove slab. Rip guide strip is nailed to side of log for straight cut. At left is catalpa log frame.

After first slab has been removed, log is placed flat side down and the second slab sliced off. Guide strip is again used.



When saw blade doesn't cut clear through, slab can be split off and projections smoothed with plane or chisel. Below: Ripping squared log into planks of any desired thickness.



MYSTIFYING TRICKS WITH BALLOONS

by Ken Murray

"Magnetized" balloon floats in air with the greatest of ease.

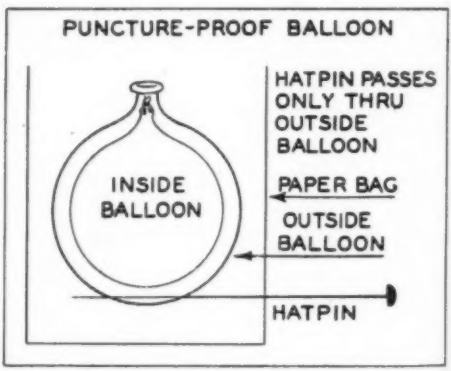
MYSTIFYING tricks with colorful rubber balloons are an immediate success for evening and after dinner entertaining. They are easy to do and require no special skill. The balloons cost only a penny each at department stores. The four tricks described here are of the same character as those exhibited by Blackstone, world's greatest magician, when he wishes to entertain informal gatherings.

The Magnetized Balloon

By rubbing an inflated balloon against your clothing you can demonstrate that it will acquire a charge of static electricity and magnetism so that it will cause hair to rise when brought near. Sometimes the charge is sufficient to cause the balloon to cling to the ceiling when tossed into the air. This is an easily demonstrated and plausible explanation for more startling tricks which you can then proceed to exhibit. When spectators try to duplicate your performance they find it impossible. You "magnetize" two fingers of your right hand so strongly that the balloon clings to it for any length of time you wish. Tossed into the air, the balloon will repeatedly become attracted to your hand and

Balloon is also caused to rise and fall at whim of magician.

The balloon is prepared by coating the inside surface with iron filings. Molasses is used as adhesive. Drawing at right shows double puncture-proof balloon trick described in text.



The tiny but powerful magnet is clipped between two fingers.

can be made to float about at your direction. Finally, to show that you can control it from a distance, you cause the balloon to float up and down several feet from the floor without apparent contact with any support.

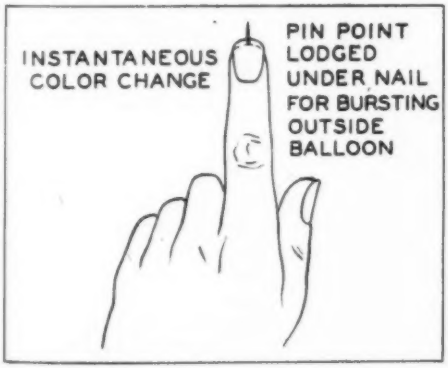
All of the tricks described here are easily prepared and take up little space in a coat pocket. To prepare the magnetized balloon, coat the inside lightly with molasses to make it tacky and add enough fine iron filings to lightly cover the inside surface. You can inflate and deflate the balloon as many times as you wish without disturbing the preparation. In addition you will need a small magnet which can be removed from one of the 10c "Snooty Pup" magnetic dogs sold in department stores. Wrap this with a turn of Scotch tape with ends of the latter forming a tab which can be gripped between two fingers. Concealed in this manner the magnet is invisible but it will attract and hold the prepared balloon to your fingers as long as you wish.

To cause the balloon to float in the air by invisible means, tie the ends of a 2-ft. piece of fine black thread to two small hooks bent from common pins. Hook each pin in one

In performing the "ambitious" handkerchief trick, prepared balloon is concealed by the kerchief, rubbed together in hands.

When balloon is inflated, handkerchief is concealed behind it.

Below: Loading the self-inflating balloon with baking soda and tartaric acid solution. When they mix a harmless gas is formed. Left: Pin point is lodged under nail in color-change trick. Size of point is exaggerated for explanatory purpose.



The color-changing trick. Two balloons of different colors appear to change hands instantly at will of performer.

Placing the "puncture-proof" balloon in a paper bag. Drawing on page 108 shows how this trick is accomplished.

Below: Although the balloon explodes when the bag is jabbed with a hatpin, it is later removed intact and unpunctured.

knee of your trousers. When seated with the legs apart the thread will be taut and quite invisible; it can, in fact, be worn beforehand without detection. To "float" the balloon merely catch the thread under the knot formed in the neck after inflating it. Bring your knees together and it will float downwards; spread them and it will rise. After doing the trick merely jerk the thread loose and let it drop to the floor; no amount of examination will then reveal how the trick was done.

The Ambitious Handkerchief

This trick is neat and as easy as it is mystifying. An unprepared red silk handkerchief is merely rubbed together in the hands for a moment and it gradually increases in size until it is seen to be a fully-inflated red balloon. To any audience this will seem an impossibility as there is not room in your clothing to conceal the balloon.

Make a saturated solution of tartaric acid in water. Place a tablespoon of the solution in a small rubber balloon and tie the neck securely. To prepare the large balloon, place in it the small acid balloon and a tablespoon of ordinary baking soda, then tie the mouth. The prepared balloon can be carried in your breast pocket along with the handkerchief. In presenting trick, conceal the balloon in your hands while rubbing the handkerchief and under cover of these moves give the balloon a sharp squeeze. This will burst the small balloon containing acid and when the acid mixes with the soda the balloon will immediately commence to inflate. When it is large enough, conceal the handkerchief behind it. A white ballon and white handkerchief could be used but the effect is not as colorful. The chemicals are harmless.

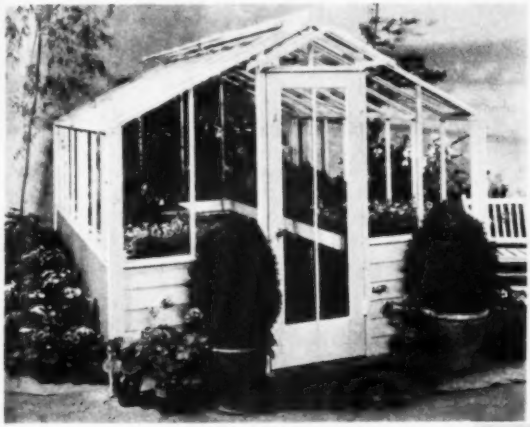
Instantaneous Color Change

This is a rapid, thrilling trick. You hold a red balloon in the left hand, a green one in the right hand. Both are fully inflated. When a spectator shouts "change" or "go," as previously instructed, there is an explosion. The red balloon is in the right hand and the green one is in the left hand, both still inflated. They have instantaneously changed places!

Get two red and two green balloons, or use any other color combination suitable to the occasion. Stuff a green balloon inside one of the red ones, neck of the green one inside

[*Continued on page* 177]

SMALL GARDEN GREENHOUSE



Left: Simple in design, this greenhouse can be duplicated by the home carpenter at moderate cost. It was designed and built by Paul Bloodgood of Pasadena. Above: Interior of greenhouse, showing how ventilators in roof are operated by chains.

by Hi Sibley

IN SPITE of mounting material costs, this little greenhouse does not involve an outlay beyond the means of the average homeowner if he contributes the labor himself. Construction is relatively simple and should not baffle any man familiar with hammer, saw and shovel. Especially the shovel, for there is a 36-in. excavation to aid in keeping plants cool in summer, warm in winter.

A six-inch concrete wall is recommended, poured between rough wooden forms, with anchor bolts set in where indicated, and provision made for the steps leading down. Sills of 2x4 lumber are bolted to the walls and 2x3 studs erected upon these, spaced 17-in. *on centers.* This allows for a ¾-in. batten between the panes; standard size of the latter is 16-in. by 24-in.

Rafters are spaced same as the studs, and on the roof the panes are lapped about one inch, secured with glazier's points on the sides and puttied over, as illustrated. The last roof pane (or light) at the eaves is prevented from slipping down by a rabbet just the depth of the glass-thickness. The sidewall frames are designed for a single pane each of the 16-in. by 24-in. glass.

Ample ventilation is provided by the two sashes which are hinged and raised through a mechanism operated by a single chain, as shown. The chain is hooked to a bench frame when open, and a varying degree of ventilation is possible by this arrangement.

Fill in with about six inches of cinders or gravel to drain off excess water after sprinkling the plants.

Plant benches should have slatted bottoms to permit air circulation from the heater below. The latter consists of

[*Continued on page* 140]

If desired, roof may be fitted with a slatted awning, made from ordinary lathes. Awning rolls up on rails and is raised enough to clear the vents. Is useful for plants requiring shade.

If garden space is limited, greenhouse can be built on flat roof of garage or porch, as indicated by arrow in photo.

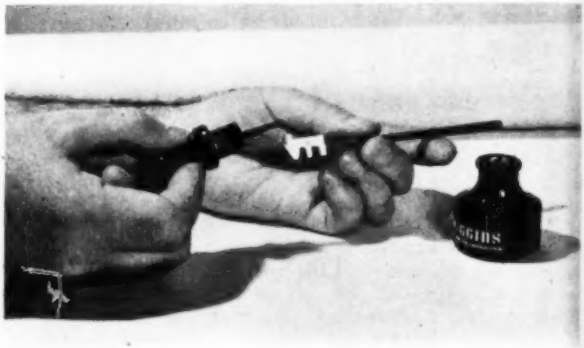
Workshop Aids

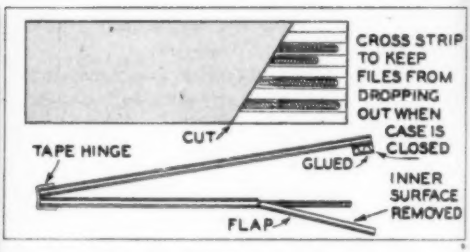
Vinegar Softens Dried Glue

WHEN mucilage or glue has been left uncorked and the glue is dried out, pour in a small amount of vinegar and let it stand for awhile. The glue will soon soften up.—*W. S.*

Draw Fine Lines With Glass Cutter

FITTED with a wick which is saturated with ink, an ordinary glass cutter is an excellent tool for drawing fine lines where neatness is important. A simple inking arrangement is shown by merely wedging a short piece of pipe cleaner behind the wheel, and then moistening it with a drop of ink.—*K. M.*





Cardboard Holds Files

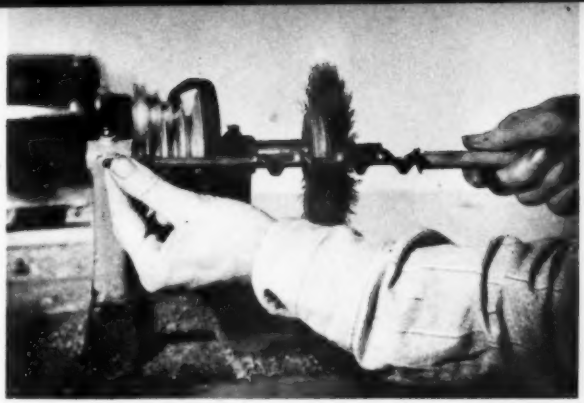
A HANDY holder for Swiss files and similar small tools can be made from a piece of corrugated cardboard. Cut two rectangles of equal size, long enough to accommodate the tools, with an inch or so to spare. Hinge them together with a strip of tape. Sketch shows details.—*W. E. B.*

Ball Bearing Embosses Feet

TO RAISE or emboss feet at the bottom corners of a metal container, drill a hole of the required size in a piece of wood and place the work over it. Hold a ball bearing over the spot and hit it sharply with a hammer, when the metal will become depressed neatly and uniformly.—*K. M.*

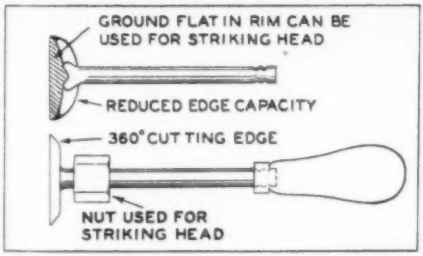
Dowel Helps Polish Augur

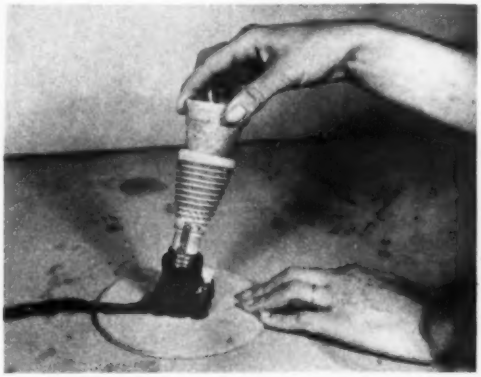
THE removal of rust spots and the general polishing of augur bits with the rotary scratch brush or the cloth polishing wheel can be made a more convenient and safe operation if you use a short handle on the cutter end while the work is being done. A three-inch length of half-inch doweling is ideal.



← Chisel From Auto Valve

DISCARDED auto valves make excellent cutting chisels when the head bevel is sharpened. They are especially useful for cutting round headed brass or iron rivets. In order to create a striking surface for the hammer, slip a large nut over the shank.—*W. C. W.*



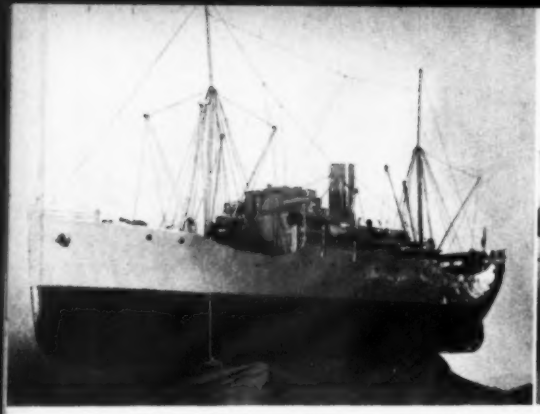


Cone Removes Hot Element

TO REMOVE a hot cone immediately after the heat is shut off (you may want the socket for other purposes) turn a soft wood cone to fit the inside of the element. Take out element by inserting wood cone and unscrewing.—*W. C. W.*

Discarded Pads → Polish Tools

INSTEAD of discarding steel wool kitchen scouring pads from which all soap has been used, drop them in a jar and keep them handy in the shop. They are useful for cleaning tools.



Left: An innocent freighter to all appearances, the Q-ship is a real sea wolf in ship's clothing. Right: Fore deck carries anchor winch and chain (pointing finger), ventilator and gun. Note extra propeller attached to deck house.

Model Q-Ship, Sea Raider

by Herbert Lozier

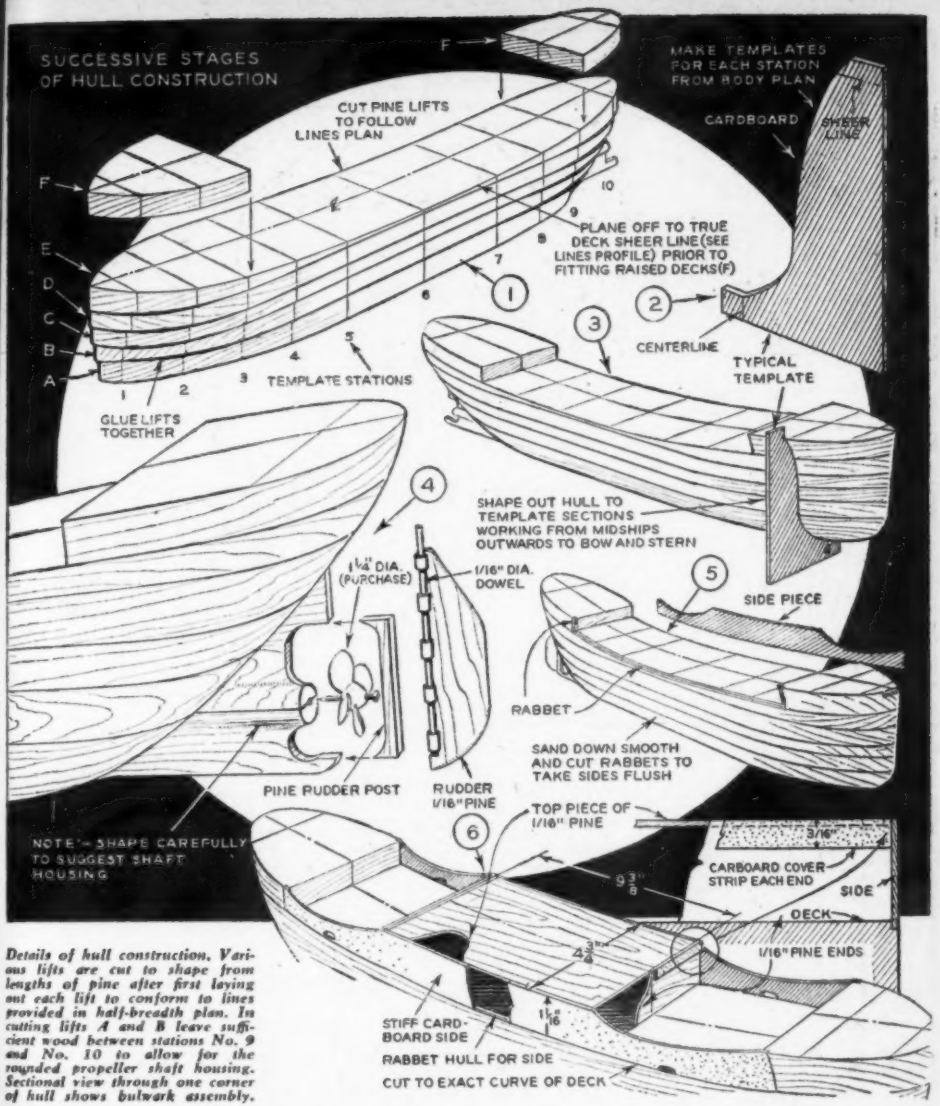
Authentic model of the type of "mystery" raider and submarine decoy used by both Allies and Axis in the Battle of the Atlantic.

Left: Deck house (being lifted off) conceals gun. Other hand indicates torpedo hiding place. Below: Realistic in detail, the model is, nevertheless, simple enough for the comparatively inexperienced modelmaker to tackle.

Q-SHIPS were first used in the last war. Their purpose, then, was to act as decoys to lure enemy submarines to their doom. They were, for the most part, old freighters mounting small guns, fore and aft, concealed beneath false deck houses, or disappearing into the deck.

They would venture forth off the convoy lanes, where subs lay in wait for a stray ship. When a sub would sight one, alone, it would rise to the surface and command the Q-ship to surrender. The latter would heave to and some of the crew would hurriedly pull away in a life boat, while unseen by the sub, the gun crew would man their stations. When the sub came close enough for the final kill, the guns would appear and likely as not the sub would be taken by surprise and blown out of the water.

During this war the Q-ship plays a different role, that of the raider. No longer wallowing freighters, but fast cargo or passenger vessels painted gray, they carry concealed torpedo tubes as well as guns. These ships are fast, doing 18 knots or more, and they stalk not only submarines, by the enemy's



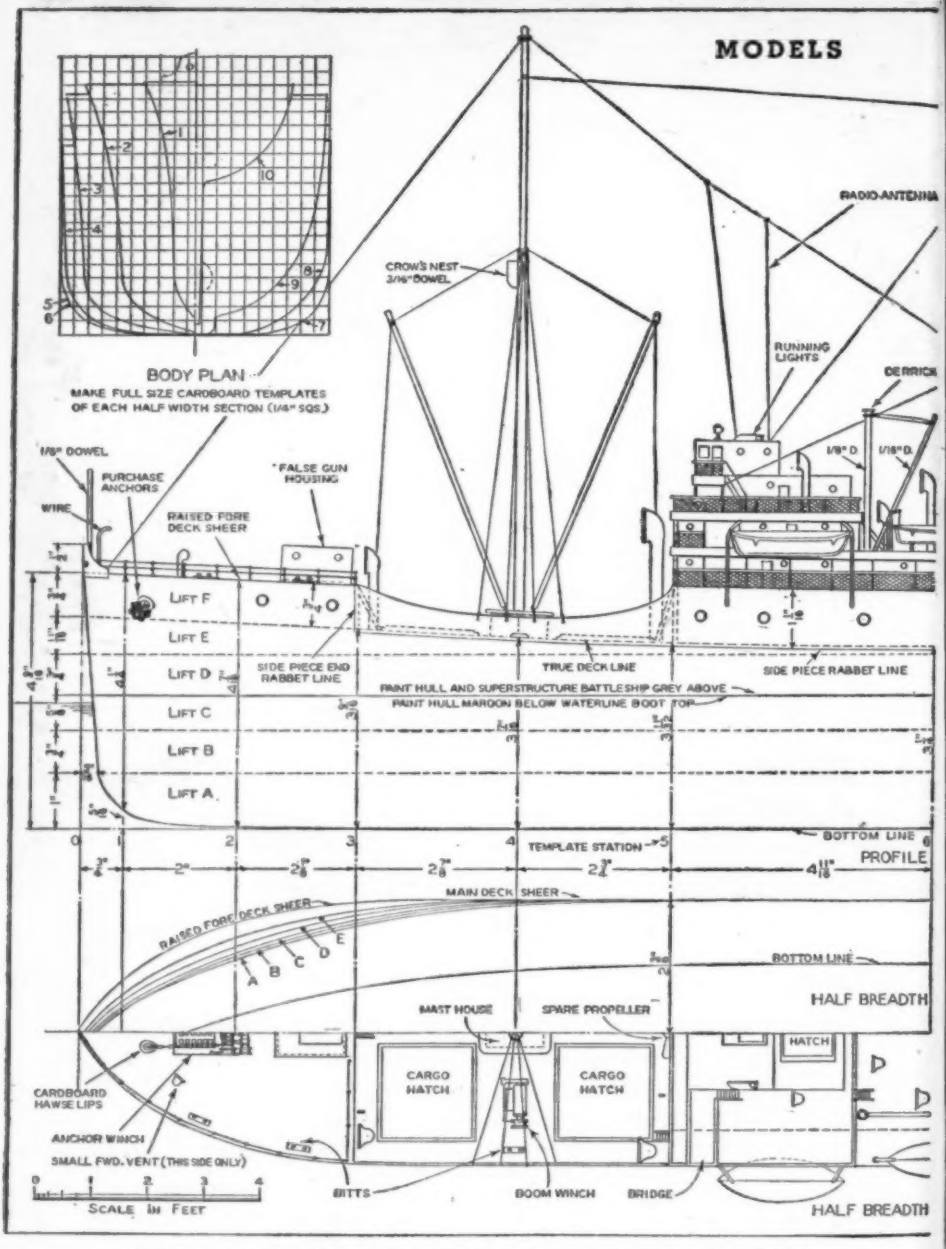
Details of hull construction. Various lifts are cut to shape from lengths of pine after first laying out each lift to conform to lines provided in half-breadth plan. In cutting lifts A and B leave sufficient wood between stations No. 9 and No. 10 to allow for the rounded propeller shaft housing. Sectional view through one corner of hull shows bulwark assembly.

merchantmen as well. It was not so long ago that the newspapers and magazines told the story of a ship, the *Zamzam*, carrying a valuable cargo that was sunk by one of the Nazi Q-ships

Building The Model

We begin with the hull. It is built in 6 lifts of clear pine, 30" long. Start by making full size patterns of the side and deck plan of the hull. Place the templates on the lifts and trace around them. Do this top and bottom (deck plan) and both sides (profile plan).

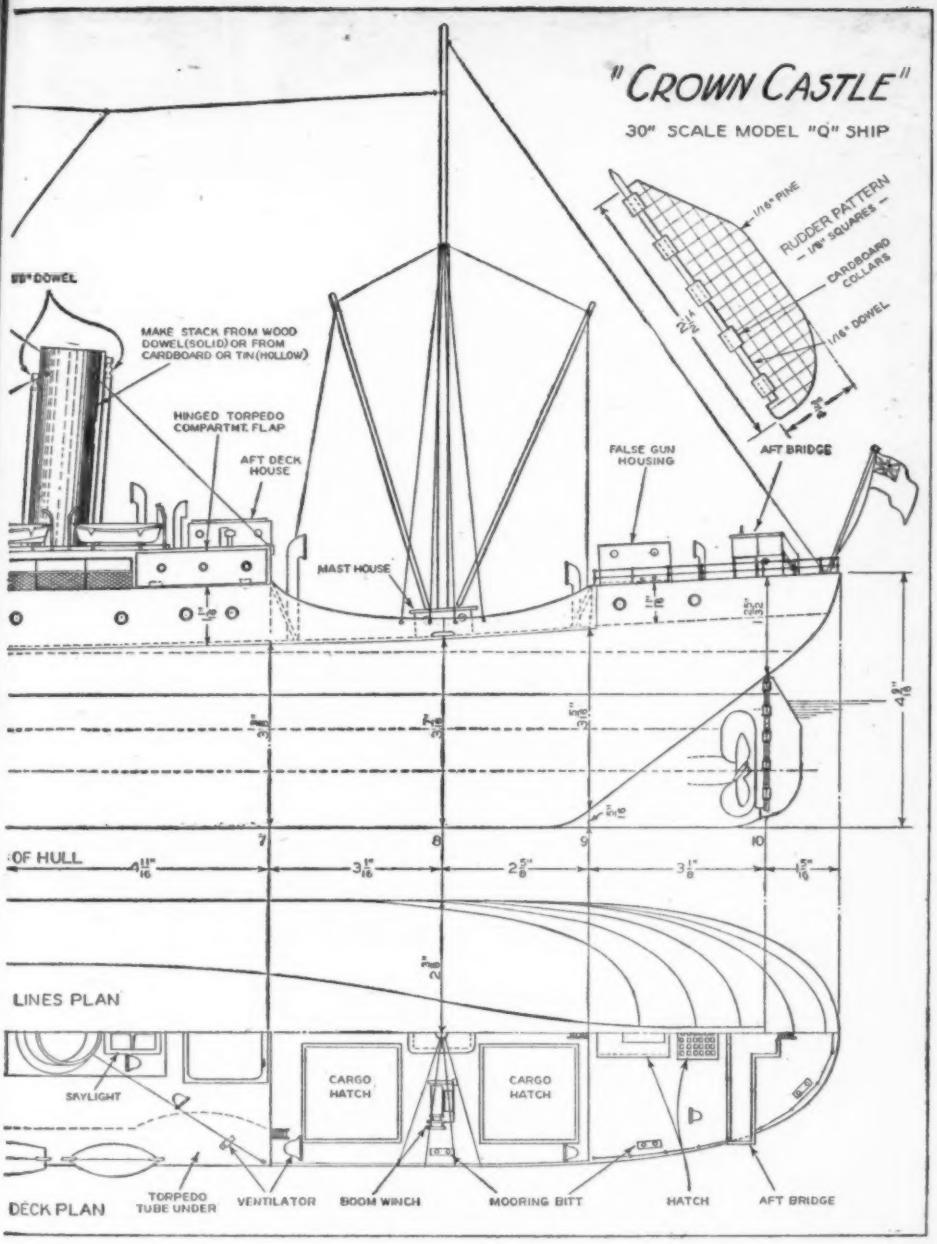
Mark the centerline on the lifts and very carefully cut them to shape. Their exact appearance is shown in the drawings. Glue up lifts A, B, C, D and E, using casein glue and clamping tightly together until dry. The waterline will automatically be located at lift C. The deck slopes amidships between the raised fo'c'sle and after decks, so this must be planed to shape before adding lifts F. The hull may now be rough-shaped, and particular



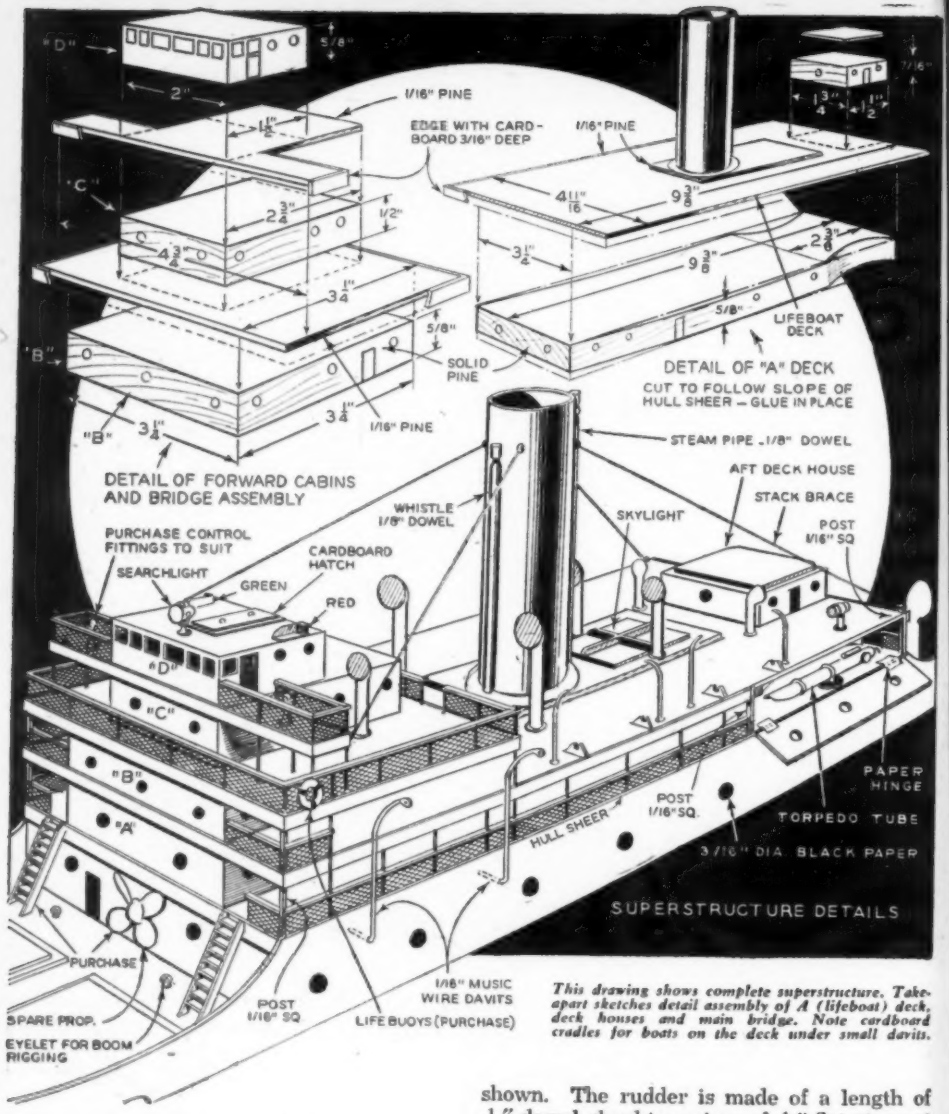
Profile and deck plans show major details of model's construction and equipment. Body plan templates are applied at designated stations to check hull shape as carving proceeds.

care must be taken at the stern, or counter, and under the bows.

The next step is to draw lines about the hull where the templates are to be placed to give the hull its final shape. These lines, called half breath plans, will be found on the body plan drawing. Make a separate template for each of the 10 stations. When these have



been made, start trimming down the hull. Begin at the center, using templates 6 and 7 and gradually work forward. Do the same toward the stern. Remember, do not cut the hull down all the way at once to fit any single template, or the hull will come out uneven, have a bumpy effect. Rather, rough it out and then gradually trim it down with a small plane and sandpaper until you have obtained the correct shape. Take particular care at the bow and stern. The drawings will give you an excellent idea of how it should be done.



This drawing shows complete superstructure. Take-apart sketches detail assembly of A (lifeboat) deck, deck houses and main bridge. Note cardboard cradles for boats on the deck under small davits.

Now is the best time to put the rudder post in place. Make it from a piece of scrap pine and cut it to the shape shown on the plan. Make sure that it fits snugly in place. Do not try to force it. Fasten it to the hull with glue, and then fill in the corners with plastic wood. Put the propeller on next. Fasten it to the hull by drilling a hole through the hub and inserting a nail through it. File off the protruding ends, if any, so that it will have a neat appearance. It need not turn. And it may be streamlined in with plastic wood, as shown. The rudder is made of a length of $\frac{1}{16}$" dowel glued to a piece of $\frac{1}{16}$" flat pine cut carefully to the shape of the rudder, as given on the profile plan. A word about the prop. Don't try to make it, as you can buy a good casting for very little. It should be 1¼" in diameter, three or four bladed. Remember there are two of them. One in its proper place and the other carried on the forward well deck, as a fitting. See the detail drawings and plans.

The sides are cut from stiff cardboard or pressed-board about 1½" wide. They are cut out to the shape shown and fastened to the

hull, by gluing in place in rabbets cut in the edges of the main deck and the fore and aft raised decks. *Make sure* that the *bottoms* of these side pieces *fit the curve of the deck exactly.*

The sides are covered, amidships, with a piece of $\frac{1}{16}$" flat pine $4\frac{11}{16}$" wide and about $9\frac{3}{8}$" long, and faced fore and aft by two pieces of the same thickness, as shown.

The main or "A" deck construction is also shown on the plans. This may be built from a solid piece of pine about $\frac{3}{4}$" thick and $9\frac{1}{2}$" long by about $3\frac{1}{2}$" wide. It must be shaped to fit the curve of the deck. It is capped by a piece of pine $\frac{1}{16}$"x$4\frac{3}{4}$"x$9\frac{3}{8}$", which becomes the floor of the lifeboat deck.

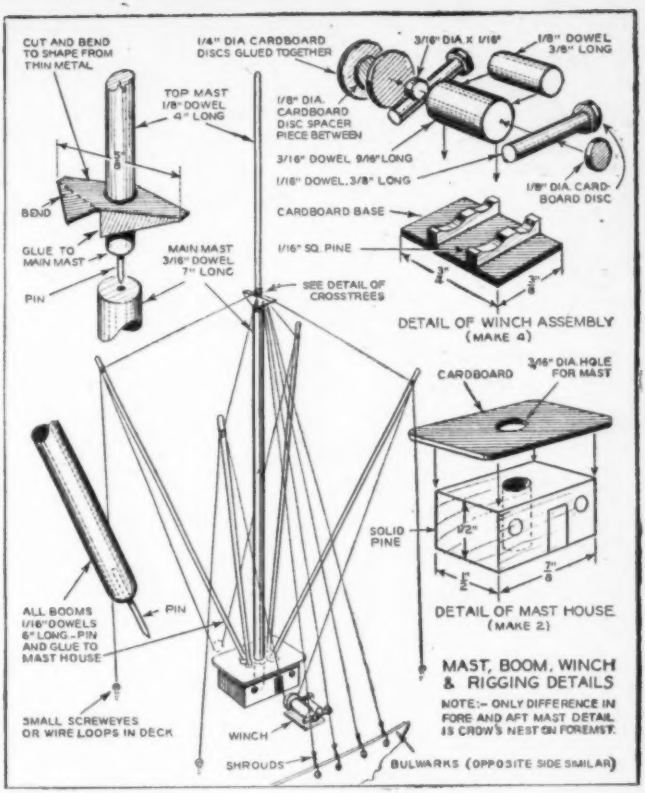
Atop this deck and forward are the cabins. They are cut from single pieces of solid pine block, glued and nailed together. Description here would only be confusing, so refer to the drawing for construction and measurements, and you will have no trouble.

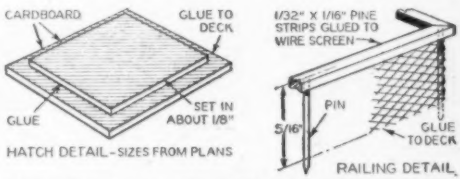
About now is a good time to paint the hull, for there are no details and it may be turned over. You can get into the spaces between the decks without anything getting in the way. Superstructure and topsides are battleship gray, and below the water line it is brick red. Give it about three coats of good grade enamel. The water line should be masked off with Scotch tape in order to obtain a straight line.

When the paint is thoroughly dry, you can start to put the port holes in place. They may be bought or simply punched out of black paper with an ordinary paper punch as near to the correct size as possible. The small port holes are $\frac{1}{8}$" in diameter and the large ones are $\frac{5}{16}$" in diameter. Their number and position will be found on the plans.

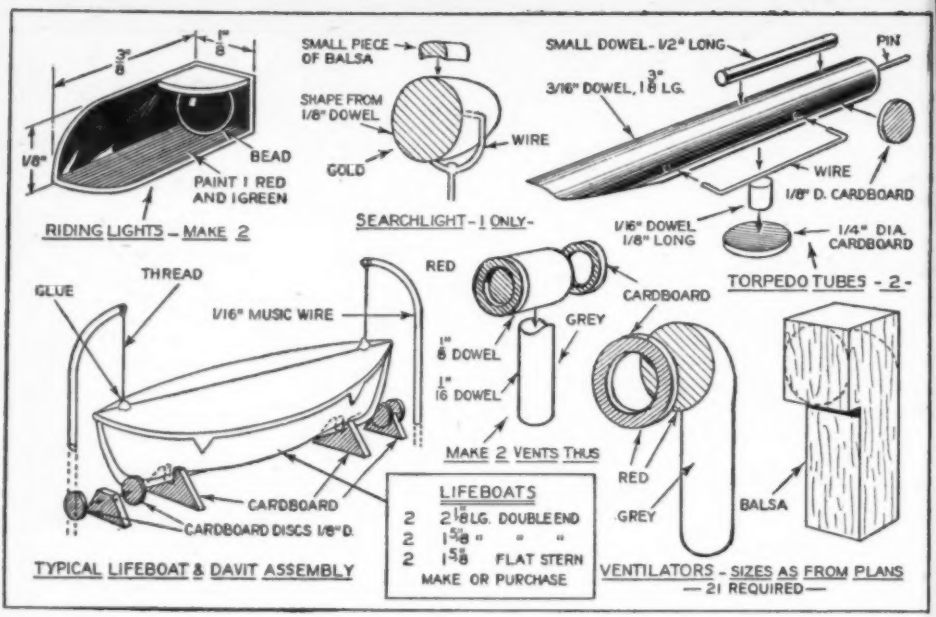
Next the uprights, made from pins, with their heads clipped off, are inserted in holes drilled at the proper spacings, in the $\frac{1}{16}$" wood. The corner pieces however, should be short lengths $\frac{1}{16}$" square wood. All the uprights may be put in place now. Try and have them cut so they don't show below the decks. And since the rails on the forward and aft raised decks are also clipped pins it is a good idea to put them in place now while you are doing this particular job.

All railings, except those on the forward and aft decks are made of screen cut diagonally in strips. The only thing you have to be careful about is your cutting. Try to keep the ends from pulling out. And make sure that you cut the strips straight.


CUT AND BEND TO SHAPE FROM THIN METAL
1/4" DIA. CARDBOARD DISCS GLUED TOGETHER
3/16" DIA X 1/16"
1/8" DOWEL 3/8" LONG
TOP MAST 1/8" DOWEL 4" LONG
1/8" DIA. CARDBOARD DISC SPACER PIECE BETWEEN
3/16" DOWEL 9/16" LONG
1/16" DOWEL, 3/8" LONG
1/8" DIA. CARDBOARD DISC
BEND
CARDBOARD BASE
GLUE TO MAIN MAST
MAIN MAST 3/16" DOWEL 7" LONG
1/16" SQ. PINE
PIN
SEE DETAIL OF CROSSTREES
DETAIL OF WINCH ASSEMBLY (MAKE 4)
CARDBOARD
3/16" DIA HOLE FOR MAST
SOLID PINE
DETAIL OF MAST HOUSE (MAKE 2)
ALL BOOMS 1/16" DOWELS 6" LONG - PIN AND GLUE TO MAST HOUSE
PIN
MAST, BOOM, WINCH & RIGGING DETAILS
NOTE:- ONLY DIFFERENCE IN FORE AND AFT MAST DETAIL IS CROW'S NEST ON FOREMST.
SMALL SCREWEYES OR WIRE LOOPS IN DECK
WINCH
SHROUDS
BULWARKS (OPPOSITE SIDE SIMILAR)

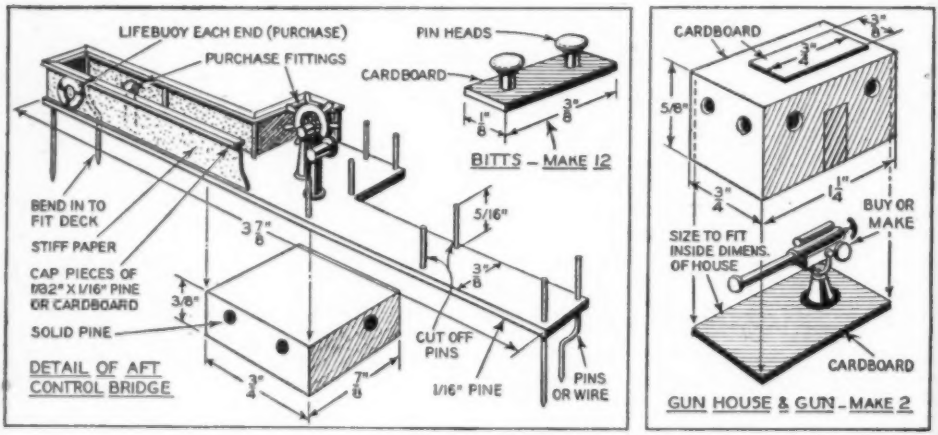


Mast and rigging assembly. Make two complete sets. Fore mast requires a short length of $\frac{3}{16}$" dowel just below crosstrees to simulate a crow's nest. Winches can be purchased or constructed as indicated. All parts are cemented together and painted gray.



MODELS

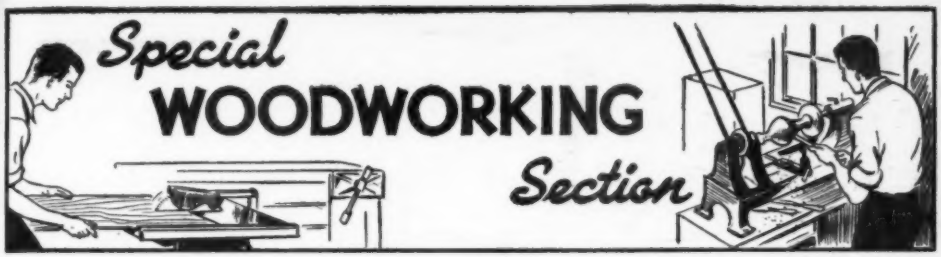
Guns may be bought or made to suit. If homemade, use 1" lengths of 1/8" dowel for the barrels; smaller pieces of dowel for the recoil cylinders and small square sections of wood for block. Cap barrel with 1/8" disk of cardboard.



Mark off your lengths with a soft pencil and ruler and cut along the line. Allow a bit more at each end than you need and trim off after they are glued in place. Don't try to bend the screen around corners. Make each piece separately. Simply glue the strips to the uprights and deck with model airplane cement, and when they are dry cement a $\frac{1}{32}$"x$\frac{1}{16}$" wood rail on top. You will find the measurements and positions on the plans.

Before you go any further make the aft bridge. It is a simple affair, as the plan shows. Cut the solid block to the size shown and cap it with a pine piece $\frac{1}{16}$" thick cut to T shape. Glue and nail it in place on the after deck and then drill holes in the T piece and insert the uprights (also pins clipped off), just as you did with the railings. You need not add screen here, but a piece of thin smooth cardboard or heavy paper may be wrapped around instead. However, the tops must be capped

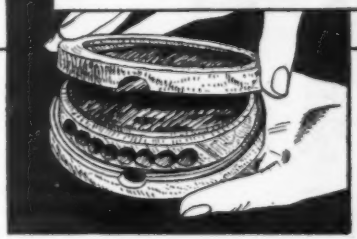
[*Continued on page 156*]



ALTHOUGH METALS IN ONE FORM OR ANOTHER ARE STILL AVAILABLE TO THE AVERAGE HOBBYIST who'll take the trouble to track them down (See article on page 58), there is little doubt that many workshoppers are going to lean more and more toward, or in some cases back to, woodworking in the months to come. No lumber shortage is in sight, and wood provides the material for countless interesting and useful projects. Starting with this issue, MECHANIX ILLUSTRATED will carry a greater number of woodworking projects, and fewer requiring metals. The eight pages that follow contain a variety of selected woodworking How-To-Builds.

MI's objective in this respect is to provide readers with the kind of woodworking ideas *they* want —if you have a pet project in mind you'd like plans for, or have turned out something original in your own shop that you think other readers might like, just drop a letter or postcard to the Woodworking Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y.

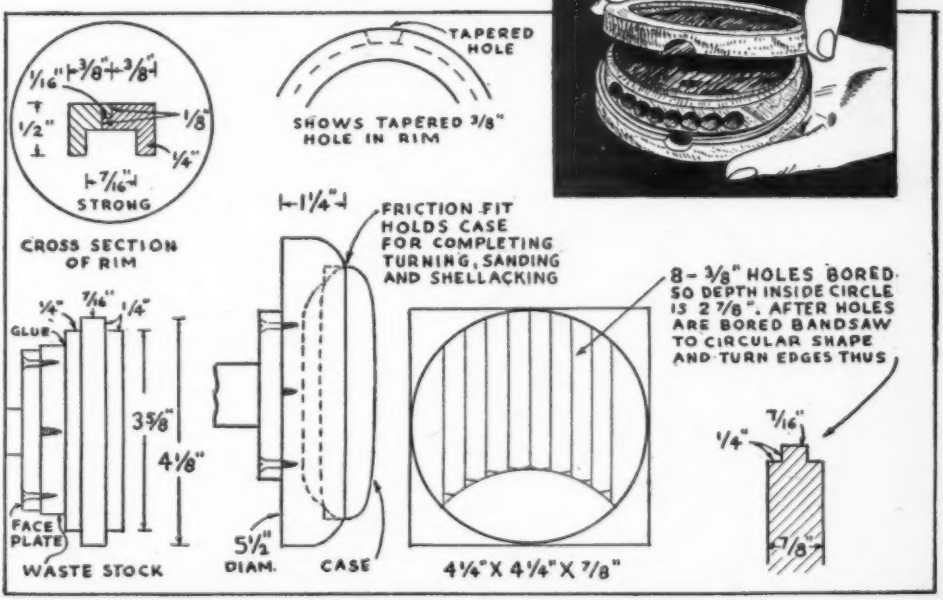
Turned Cigarette Case



EVERYONE will admire this clever modern cigarette case. Neat, compact in shape, it fits the hand and is easily carried in pocket or purse. It consists of 3 pieces of hardwood, selected for beauty of grain. Maple or walnut make beautiful cases.

For the body of the case cut a piece 1" in thickness and 4¼" square. Then bore a series of holes in this block using a ⅜" bit. Boring the holes while the block is square facilitates this operation. Slip a dowel in each hole before you bore the next hole. This dowel should be sanded slightly so it can be withdrawn readily. After bandsawing the block to circular shape, glue it to wastestock and mount on the

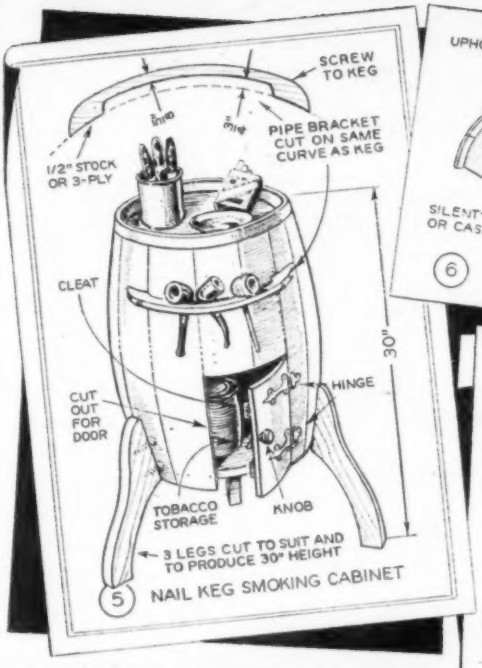
[*Continued on page* 166]

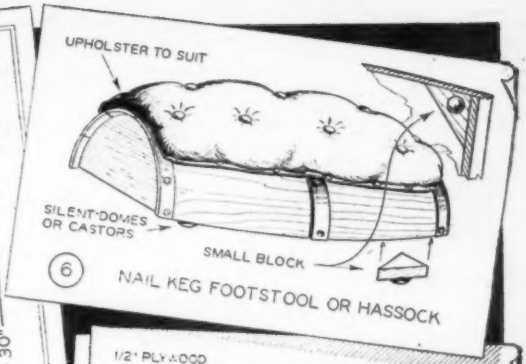


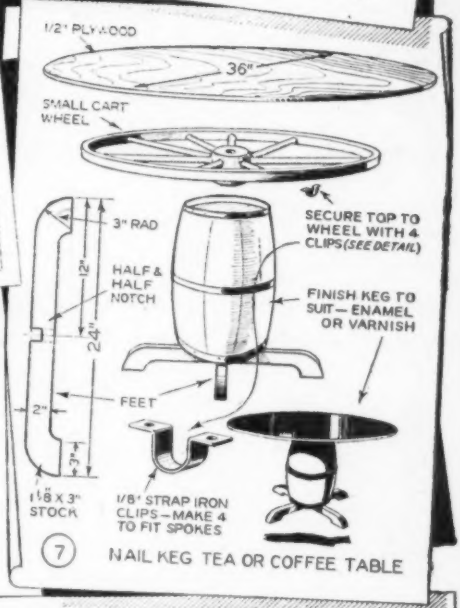
NAIL KEG

EMPTY nail kegs are far more valuable than may be generally realized. Instead of using them for kindling or trash containers they can be converted into fine little pieces of furniture for the play-room or camp. They can be obtained chiefly from any hardware store, lumber yard or contractor and a dollar's worth will provide all the material necessary for a lot of interesting and useful equipment.

Fig. 1 shows a simple piece; a stool composed of a solid keg with both top and bottom in place. First, in all these pieces, remove all nails, splinters, etc., that might catch on the clothing and also remove the wire hoops



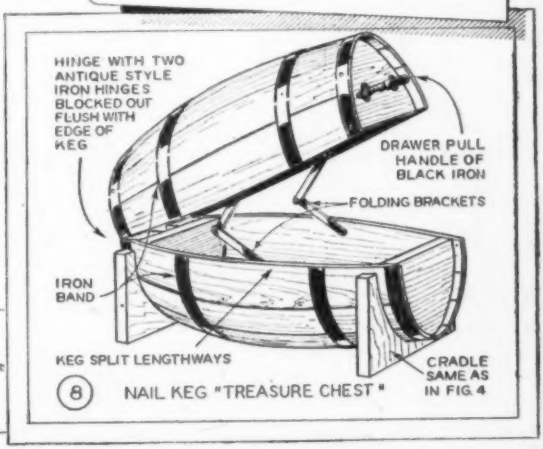


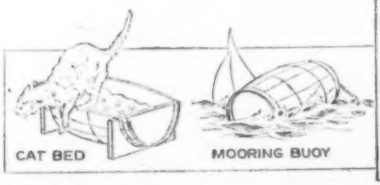


FURNITURE

around the middle and substitute band iron hoops if possible. Otherwise staple the wire hoops down solidly and turn all staple points inside. Then smooth off with coarse sandpaper and follow with fine paper until the outside surface of the keg is smooth and free from all possible abrasive surface spots. Two or three coats of suitably colored, quick-drying enamel will take care of the finishing touches. When the stool has been thus completed have a female member of the family make a tufted cushion that will fit over the top head nicely and finish off with a

[*Continued on page* 162]


HINGE WITH TWO ANTIQUE STYLE IRON HINGES BLOCKED OUT FLUSH WITH EDGE OF KEG
DRAWER PULL HANDLE OF BLACK IRON
FOLDING BRACKETS
IRON BAND
KEG SPLIT LENGTHWAYS
CRADLE SAME AS IN FIG. 4
8 NAIL KEG "TREASURE CHEST"



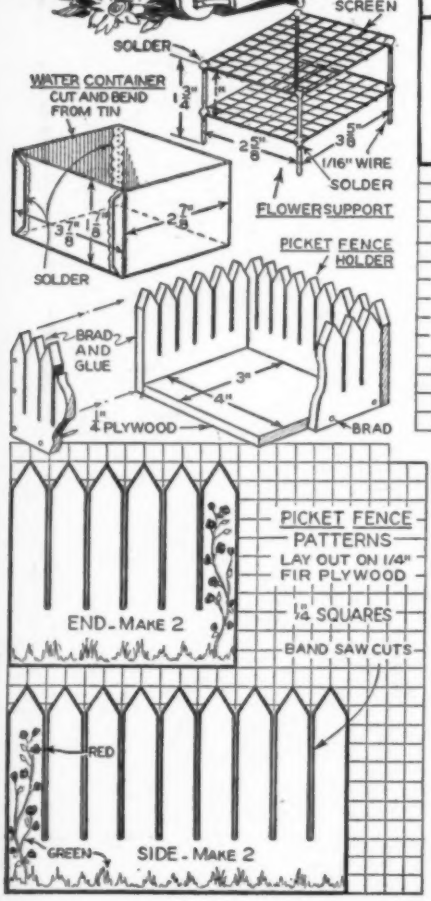
INDOOR GARDEN
for cut flowers

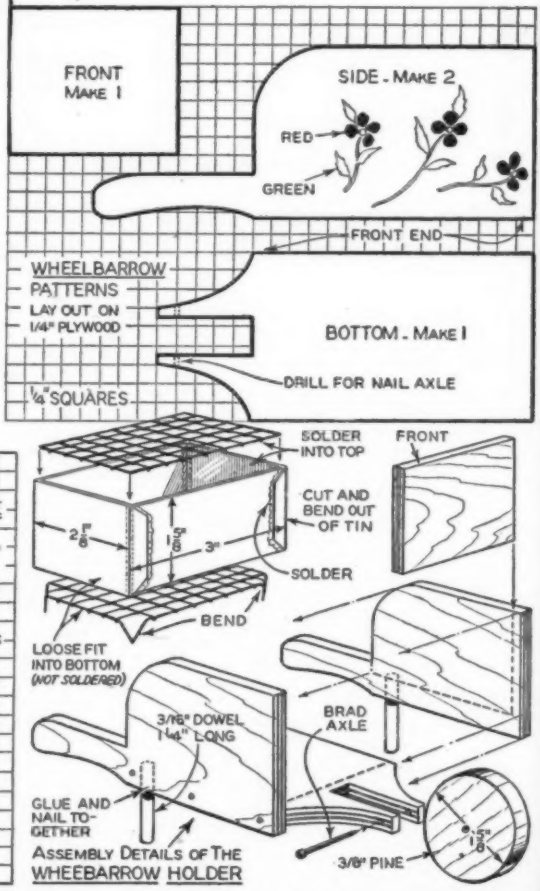
THESE cut flower holders embody the garden idea in design and are simple woodworking projects. Small and compact, they are especially correct for short stemmed posies such as pansies, sweet peas and rambler roses. To make them you'll need fir plywood ¼" thick and some storm screen in ¼" or ⅜" mesh. Also sheet tin or light galvanized iron for the water containers. Oh, yes, and a bit of brass or copper wire for legs for the picket fence flower support.

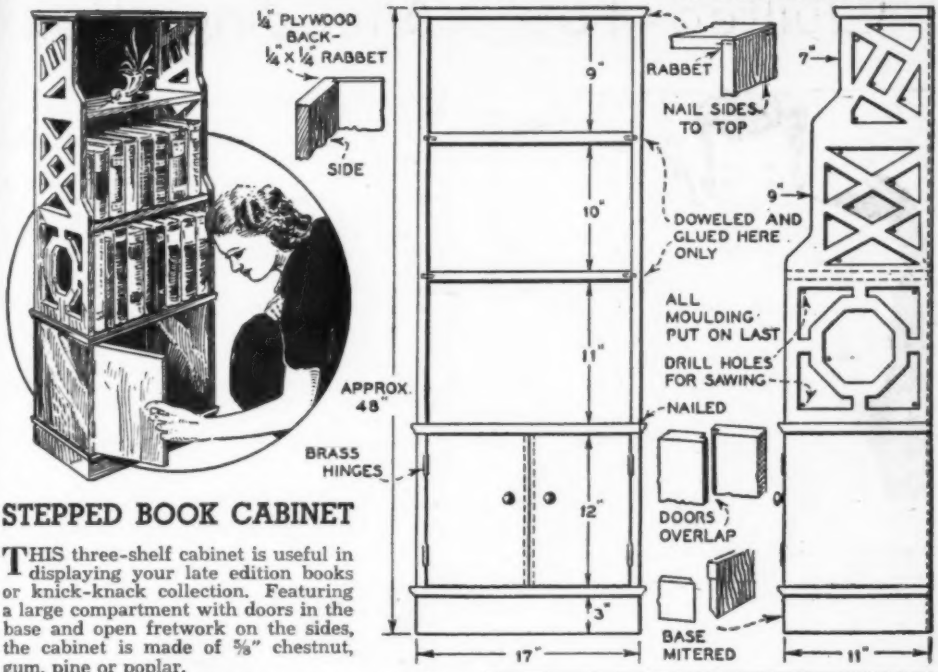
Picket Fence Holder

Lay out two end and two side pieces on the plywood over the ¼" squares. The saw cuts extend down to within ¾" of the bottom. Be sure the pieces are square. Cut out the bottom

[*Continued on page 160*]







STEPPED BOOK CABINET

THIS three-shelf cabinet is useful in displaying your late edition books or knick-knack collection. Featuring a large compartment with doors in the base and open fretwork on the sides, the cabinet is made of ⅝" chestnut, gum, pine or poplar.

The sides are cut 47¼" long and about 11" wide and a ¼"x¼" rabbet runs along the back of each. The fretwork is drawn in pencil upon the wood and cut out with a coping saw or jig saw. Shelves 1 and 2 are doweled and glued into place. A bar clamp which has had the rivet removed so that the end piece can easily slide off, is utilized in clamping through the fretwork while glue sets. The other shelves are nailed with No. 6 finishing nails and heads will be concealed by moulding.

[*Continued on page* 168]

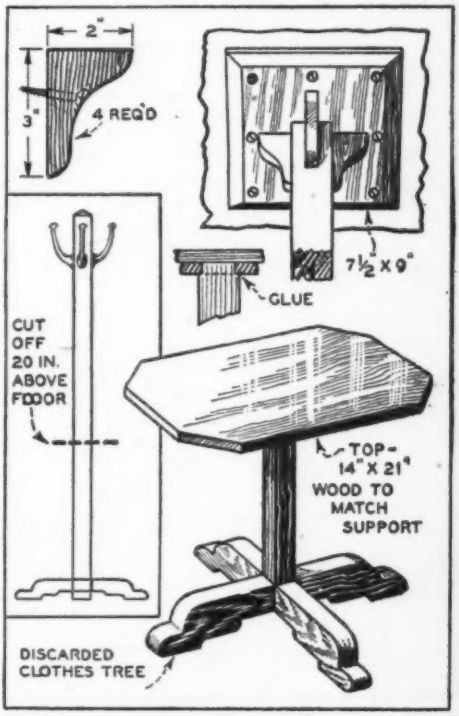
CLOTHES TREE TABLE

IF YOU are in need of another small table, look up that old clothes tree long tucked away in the attic or cellar. Or, lacking a personal furniture morgue, hunt one up in your nearest junk shop.

The table in the drawing was made from just such an old clothes tree; a fugitive from an office cleanout. First it was sawed off to stand 20" from the floor. The plank (21"x14") from which the table top itself was made happened to be lying around the workshop. An additional piece of board (7½"x9") was then glued to the top of the sawed-off post, previously having had a hole cut in its center the exact dimensions of the post.

The board into which the post had been secured was accurately centered upon the less perfect side of the table top board. Short screws and glue were then used to pin the two pieces firmly together.

After assembling, and with the glue dry, the table was ready for finishing (see article on finishing in *The School Shop* section), which was carried out with stain, shellac, steel-wooling and waxing, in that order.—*Anne Estabrook.*

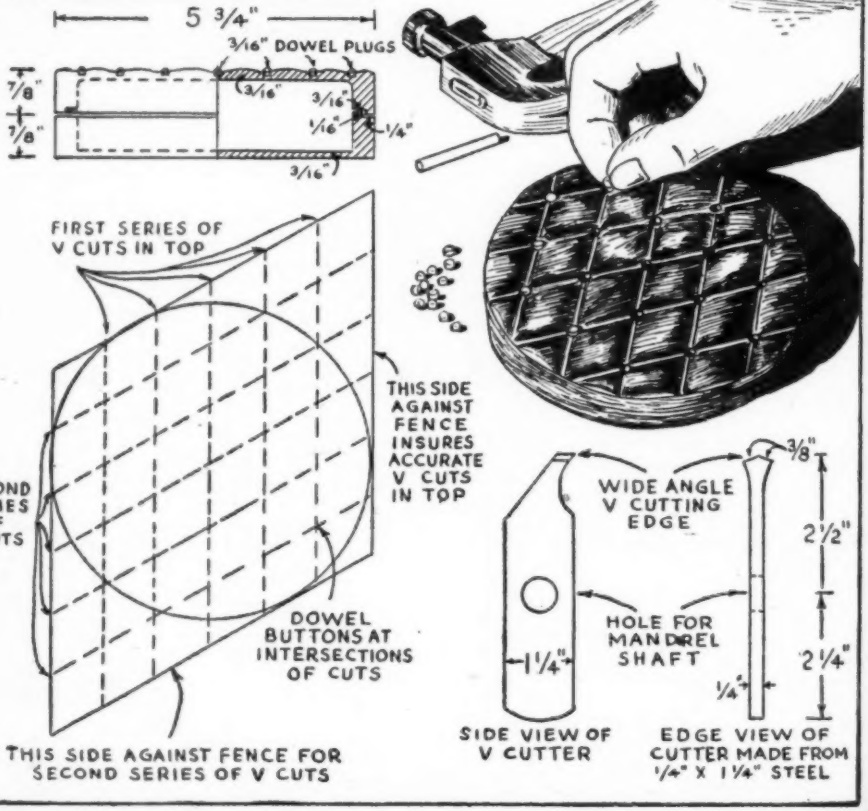


"Quilted-Top" Mending Box

MILADY has quilted comforters, bed jackets, pillow tops and linen cases—now she can have a matching mending box to further satisfy her desire for popular quilted loveliness.

Select a piece of 1" walnut for the top and cut to diamond shape. Then place face down on the saw table and make a series of wide angle V-shaped cuts, using a special cutter ground as shown in the drawing, and mounted on the saw mandrel. These cuts are easily and accurately done by moving the fence over 1" at a time. When you have made five parallel cuts, turn the block and make a second series of cuts to criss-cross the first series. Now you are ready to bandsaw the block to circular shape. Next, glue a piece of waste stock to the grooved face. When the glue is dry mount the work on the faceplate and turn the inside and outer edges to shape. Give the work a good sanding and shellac while still in the lathe. Turn the lid off the waste stock and with a chisel dress off the edges of the V-cuts. Care-

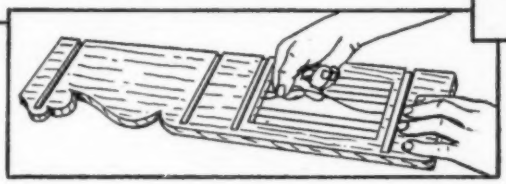
[*Continued on page* 164]

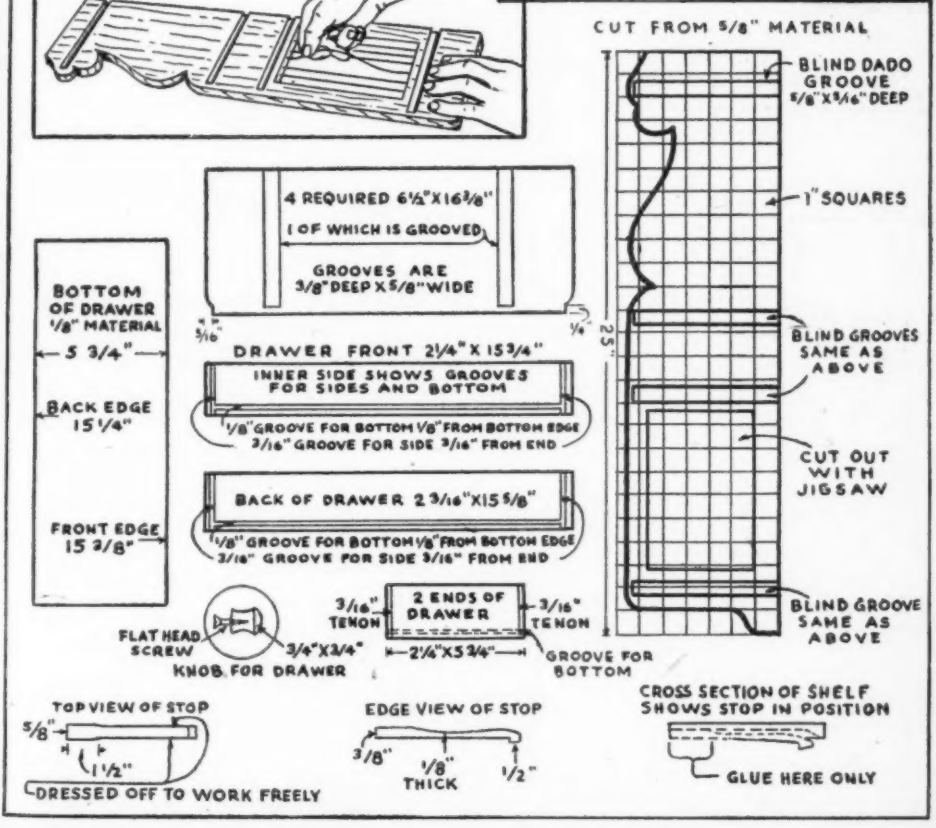


decorative WALL SHELVES have drawer

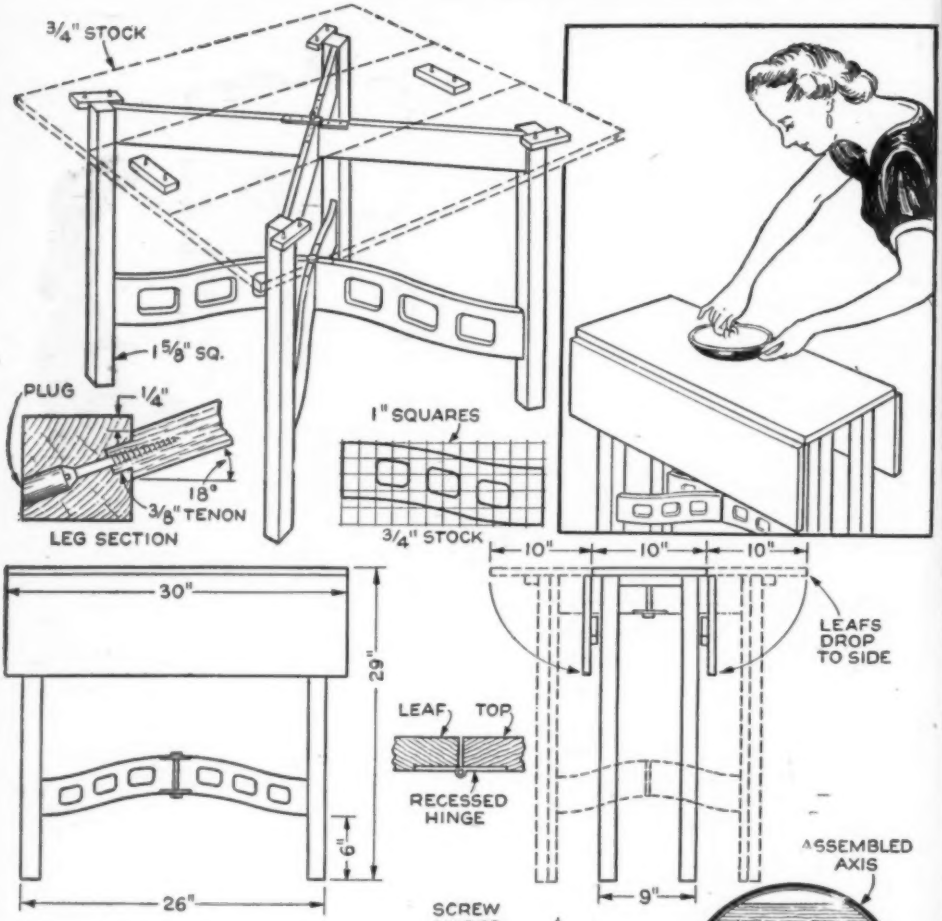
ONE of the finest projects for craftsmen who are adding reproductions to their homes is this beautiful wall rack of the Regency period. It will add character and dignity to the home. The interesting wire treatment of the side panels imparts an unusual and distinctive charm. Bicycle spokes were used here. They are stiff and straight and easy to work with. Copper or brass wire could be used instead, if available. The cleverly designed drawer stop serves a double purpose, as it not only safeguards the drawer being pushed in too far, but prevents it from being pulled out and perhaps dropped.

The shelves are best made of walnut or mahogany, 5/8" thick, though any desired wood may be used. Sides are bandsawed to shape and the jigsaw is used to cut out the openings, after which dado grooves are cut for the shelves. It is a simple job to make the drawer according to dimensions shown in drawings. Inset shows insertion of bicycle spokes in sides.




CUT FROM 5/8" MATERIAL
BLIND DADO GROOVE 5/8" X 5/16" DEEP
1" SQUARES
BLIND GROOVES SAME AS ABOVE
CUT OUT WITH JIGSAW
BLIND GROOVE SAME AS ABOVE
4 REQUIRED 6 1/2" X 16 3/8"
1 OF WHICH IS GROOVED
GROOVES ARE 3/8" DEEP X 5/8" WIDE
5/16"
1/4"
25"
DRAWER FRONT 2 1/4" X 15 3/4"
INNER SIDE SHOWS GROOVES FOR SIDES AND BOTTOM
1/8" GROOVE FOR BOTTOM 1/8" FROM BOTTOM EDGE
3/16" GROOVE FOR SIDE 3/16" FROM END
BOTTOM OF DRAWER 1/8" MATERIAL
5 3/4"
BACK EDGE 15 1/4"
FRONT EDGE 15 3/8"
BACK OF DRAWER 2 3/16" X 15 5/8"
1/8" GROOVE FOR BOTTOM 1/8" FROM BOTTOM EDGE
3/16" GROOVE FOR SIDE 3/16" FROM END
FLAT HEAD SCREW
3/4" X 3/4"
KNOB FOR DRAWER
3/16" TENON
2 ENDS OF DRAWER
3/16" TENON
2 1/4" X 5 3/4"
GROOVE FOR BOTTOM
TOP VIEW OF STOP
5/8"
1 1/2"
DRESSED OFF TO WORK FREELY
EDGE VIEW OF STOP
3/8"
1/8" THICK
1/2"
CROSS SECTION OF SHELF SHOWS STOP IN POSITION
GLUE HERE ONLY

FOUR-LEG DROP LEAF TABLE



DETAILS OF PIVOTED ARMS
(LOWER BRACKETS PIVOTED SAME)

THIS interesting table, adapted from an antique model for home workshop construction, has only four legs instead of the customary six in a drop leaf design of similar size. Each leg is pivoted independently, and closed or open presents a neat appearance. Throughout, plans are developed for simple construction with ordinary tools. Edges of the table top are square and no shaper is required. Pivoted arms are mortised into the legs as shown in the sectional view, and secured with long screws and casein glue. Screws are well counterbored and plugged over.

[*Continued on page 161*]

WOODWORKING

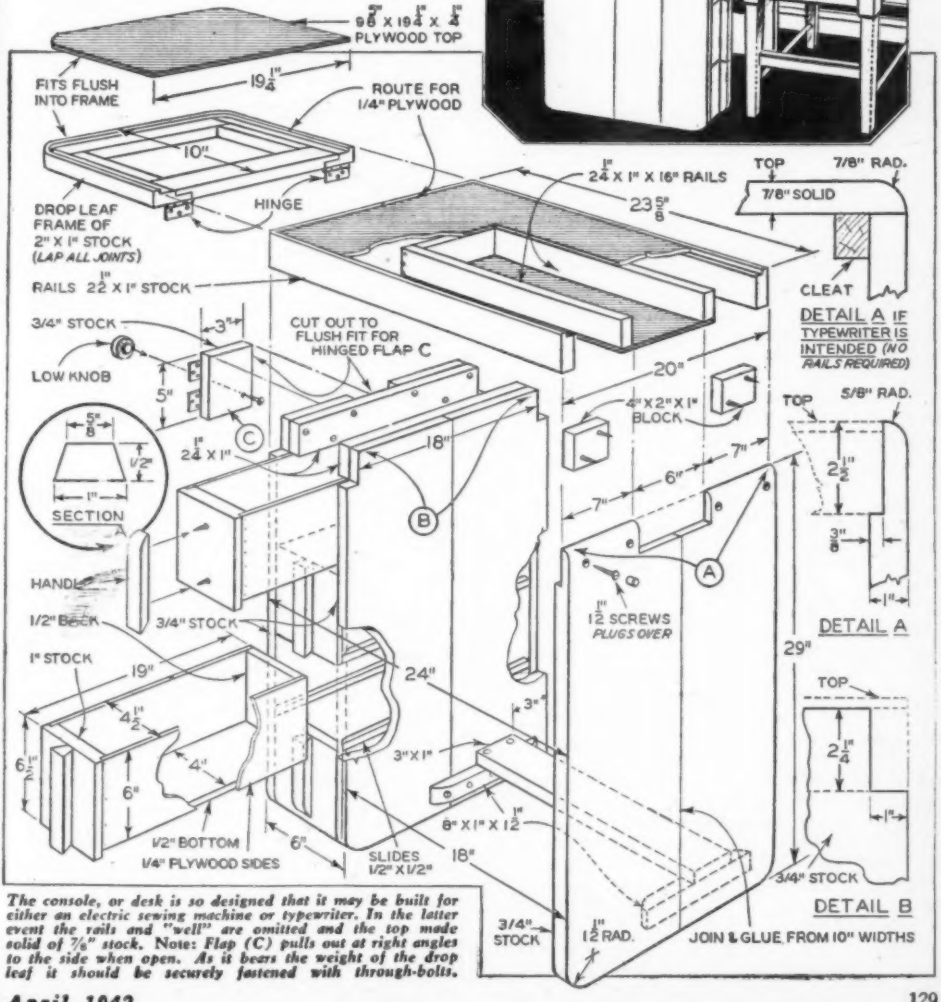
Sewing Machine Console

IT HAVING been scientifically established that 29" is the most comfortable working level, this little table is so designed as to place the sewing surface of an electric machine at that height.

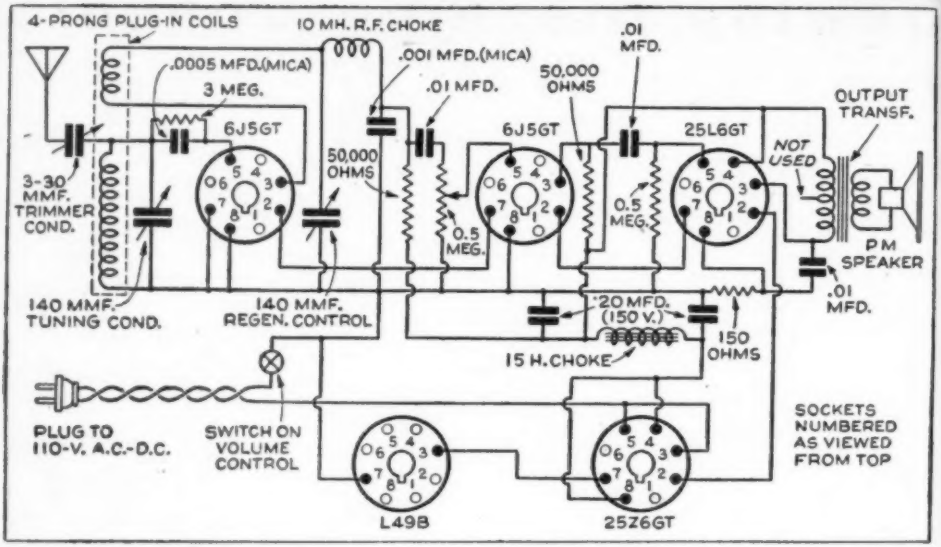
The ¾" thick sewing desk's sides and the 1" thick end slab are joined and glued up of 10" stock to the dimensions shown. Note that the end piece is rabbeted to take the rails of the top, and that the two small blocks shown are glued and screw-fastened in this groove to hold the plywood working surface.

The take-apart perspective drawing is practically self-explanatory, and a careful study of it will make the construction clear. From it a list of necessary lumber can also be quickly compiled.

Table may have a natural finish, or be painted.



The console, or desk is so designed that it may be built for either an electric sewing machine or typewriter. In the latter event the rails and "well" are omitted and the top made solid of 7/8" stock. Note: Flap (C) pulls out at right angles to the side when open. As it bears the weight of the drop leaf it should be securely fastened with through-bolts.



The "PR" Receiver

[*Continued from page* 105]

it is necessary that a rectifier tube of greater current handling abilities be used. We do this with a 25Z6GT tube.

An interesting thing about this amplifier is the use of inverse-feedback, a feature which increases the quality of reproduction. The .01 mfd. condenser connected between the plate and cathode of the 25L6GT feeds back a small amount of out-of-phase voltage from the output to the input of the stage. This inverse-feedback has many beneficial effects. It increases the frequency range of the amplifier, reduces the hum and stabilizes the speaker load.

Only two additional parts need to be mounted. Because one extra tube is used, it means that another socket must be mounted to the baseboard. You may find it necessary, as we did, to shift the locations of one or two of the parts used in last month's receiver to find room for the additional socket. This socket is screwed to the baseboard, like the others, ½" above the board by means of bakelite spacers. The volume control is mounted on the front panel through a ⅜" hole, centered between the two condenser dials.

The diagram has been drawn to show the complete new receiver rather than merely the additions. It is just as well that you recheck the entire circuit as you make the additions. One of the sockets that was formerly used for a ballast tube is now rewired slightly to accommodate the 25Z6GT rectifier tube. The filament series circuit must now be broken and the 25L6GT tube socket wired into it. Socket connections to the second 6J5GT tube must be changed, too. You will probably find it easier to strip all wiring from your previous receiver with the exception of those applying to the detector tube, coils, and variable condensers.

Additional Parts Required for Amplifier

1—25Z6GT tube (Knight)
1—25L6GT tube (Knight)
1—5" P.M. speaker (Utah 5P)
1—Universal output transformer (Utah 8758)
1—500,000 ohm potentiometer with built-on switch (Knight 30-434)
2—50,000 ohm ½ watt carbon resistors (Knight)
1—500,000 ohm ½ watt acrbon resistor (Knight)
1—150 ohm 1 watt carbon resistor (Knight)
3—.01 mfd. 400 volt tubular paper condensers (Knight)
1—Octal wafer socket (Allied Radio)

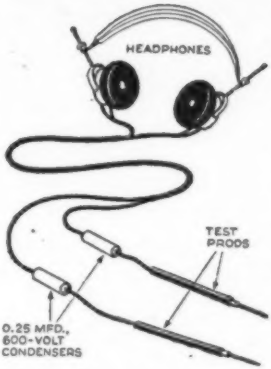
As mentioned before, all connections should be securely soldered, using rosin core solder only. An acid flux should never be used for soldering electrical parts. Make all of your leads as short as possible. Clip off any excess pigtail leads from the resistors and condensers if they are not needed.

The Fahnestock clips formerly used for the headphone connections will now be used for the speaker. Headphones can still be used on the output of this receiver, but it is not recommended because the current drawn by the power tube is a little too much to pass through sensitive headphones, and is liable to burn them up in time.

Although a 5" speaker was used, the size is not important. You may use any size from 2" to 12"—the bigger the better. In choosing your speaker, be sure you select a universal type of transformer designed to mount right on the speaker frame. The speaker can be mounted on the front panel, making a single unit job out of your receiver. A larger panel, of course, must be used. Much better tone quality will be obtained, however, if the speaker is mounted on a panel or baffle that is thicker than the panel used for your receiver.

[*Continued on page* 161]

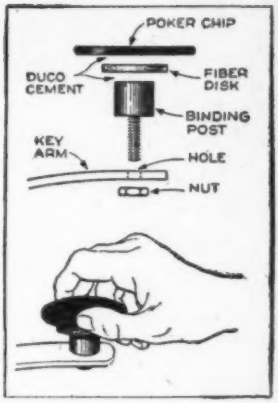
RADIO SPARKS



Tube Puller For Service Bench

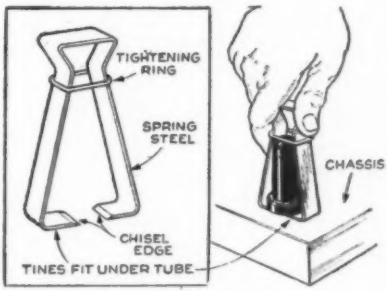
PULLING tubes with the fingers is sometimes hard work but with the gadget shown below the job becomes easy, especially where one is doing this most of the day in service work. Heat a piece of steel an inch or more wide and bend it in the form of a pair of tongs. Then reharden and grind the tine edges down to a chisel edge. Fashion a steel ring that can be slid down over the tines and close them as it moves downward.

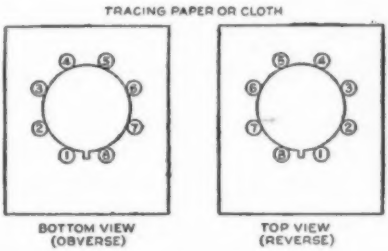
To remove a tube it is only a matter of placing puller under base.



Tester Locates Audio distortion

IT IS a simple matter to locate audio distortion in an audio amplifier either in a receiver or transmitter with this tester. A pair of head-phones, two fixed condensers and a pair of test prods will suffice. Solder a .25 mfd. fixed condenser of 600 volt working voltage in series with each phone lead and a test prod. This entirely breaks the DC from the phones but allows plenty of audio to pass. Then, with one prod say on the minus or neutral side, explore with the other, judging the quality by the phones. By starting at the input side of the audio section, a continuity test can be carried on and the point of disturbance located.





Key Knob Of Simple Materials

IF THE knob to your transmitting key becomes broken a good knob can be quickly made to replace it as shown above.

As a base, use the bolt end of a spare binding post. Rough the top of the bakelite ferrule and to that cement or otherwise fasten a small celluloid disk or one fashioned out of fiber, plastic or even heavy presdboard. Then to that disk cement on a common poker chip of the desired color. By using any good grade of household cement such as Duco, O.K. or other of the same type, lasting joints can be made and the knob will serve as well as a manufactured affair.

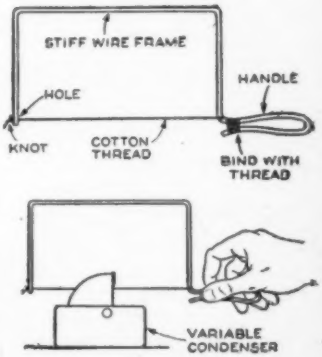
Reading Of Tube Socket Connections

WHEN wiring a set from the top side one often becomes confused wiring the sockets from a diagram showing bottom.

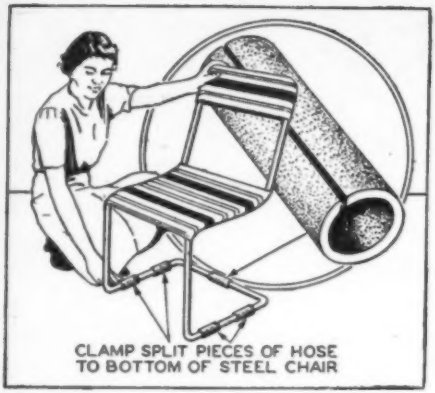
Draw the socket connection diagram on a piece of tracing paper or cloth or any fairly translucent piece of material. Number terminals as usual from 1 to 8, reading to left from pin. It is then only necessary to read drawing from back side.

Cleaner For Variable Condensers

MANY variable receiving condensers are precision made and have their plates working with a very small air gap. A good cleaner can be made by bending up a wide U-shaped frame of stiff wire, forming a handle at one end. Flatten the free end and drill a small hole through it. Run a soft cotton thread through the hole and lash it to handle end.



Helps Around

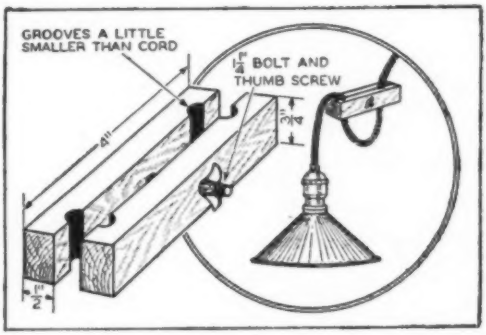


← Improving Steel Chair

TUBULAR steel chairs are fine for the porch or patio, but if yours has a cement floor the chairs will scuff, scrape and make a lot of noise when moved around. Four or five short pieces of garden hose split down one side and slipped around the bottom tubing will alleviate this annoyance.—*F. C.*

Shortening Drop Cord

ILLUSTRATED at right is a simple clamp with which drop cords may be shortened without the necessity of cutting them. Make it from a single block of wood 1" thick. Bolt and thumb screw or wing nut complete the gadget.—*R. J., Jr.*

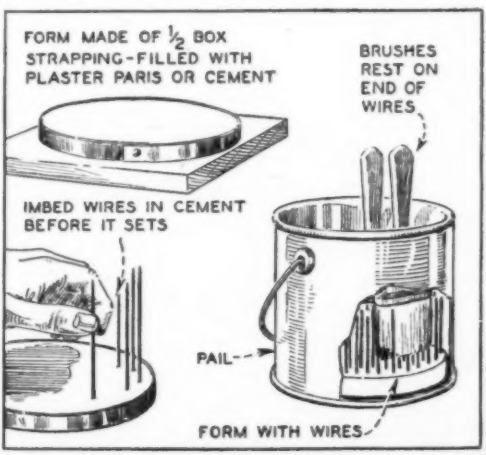


Paint Brush Preserver

A CONTAINER for paint brushes that keeps the bristles in good condition and will hold more brushes than the cans with wire contraptions across the openings, is shown in the drawing below. Cement is poured into a round form slightly smaller than the diameter of the container. Wires are imbedded in the cement while still soft. When hard, slip the base into the pail, fill with turpentine to top of wires.

Label Protector For Medicine Bottles

IT'S a good idea to cover the labels on medicine or other bottles containing frequently-poured liquids with Scotch tape. Drippings that run down the side of the bottle can then be washed off.



The House

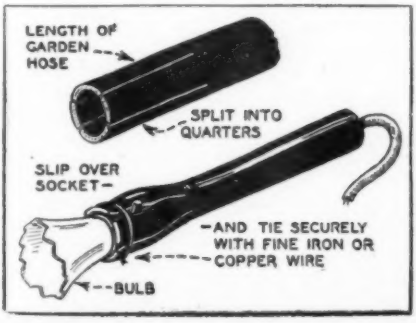
Card File From Comb

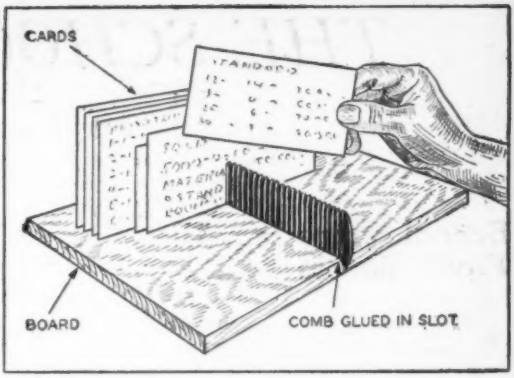
WANT a quickly-made letter or card file? Get a coarse comb about 6" or more in length. Saw a wide slot across the grain of a suitable board into which the back of the comb will make a tight fit. Glue in place.

CLOTHES WON'T DRY OUT IF PLACED IN AN UPRIGHT POSITION, AS SHOWN.

Hiding Place For Valuables →

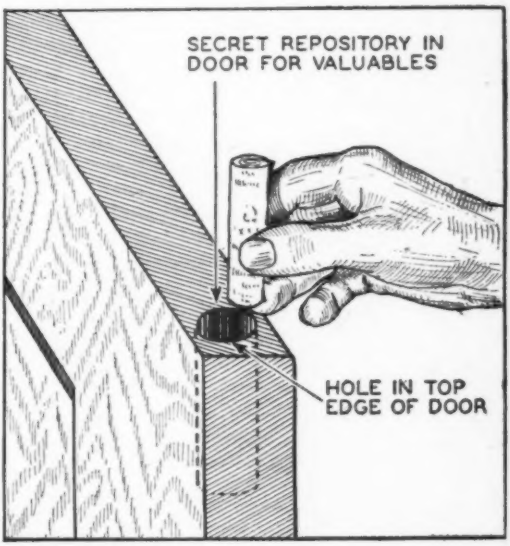
BORE a hole as large as possible to the depth of 4" into the top edge of bedroom or closet door. The latter is preferable as it is generally closed. Place valuables in the hole and plug with a snug fitting cork. This cache will go unnoticed even with door open.





← Clothes Won't Dry Out

AFTER sprinkling freshly laundered clothes for ironing, place the folded garments in an upright position in the basket. The clothes will not tend to dry out as quickly as they do when placed flat, and you can quickly and easily locate the garment you wish to iron.—*B. N.*



Handle For Extension Cord

THE cellar extension cord and repair light may be provided with an insulated sure-grip handle at no expense whatever. Simply slice off an 8" scrap of old garden hose, split as shown at left, and slip over the socket (from the cord end, naturally). Bind the ends with fine wire so they can't slip off.—*A. H. W.*

THE SCHOOL SHOP

Conducted by Frank Petraglia,
Shop Instructor, Samuel Gompers Industrial High School
New York City

School Shops Join The Production Lines

ARE you school and home workshop devotees wondering how you can put your particular manual skills to use in the national defense effort? Boy or man, your skill with tools can be turned to immediate advantage by participating in a praiseworthy undertaking which has just recently been initiated by the industrial arts and vocational school shop students of Chicago.

The school shop students of Chicago have pledged themselves to produce approximately 10,000 games of all kinds for distribution by the USO to the army and navy recreational centers stationed in that city. This is a big order, for a big city, and the Chicago students will certainly fill it if they have pledged themselves. And in the Galileo High School, San Francisco, 400 stretchers were completed for the Red Cross by shop students under the direction of instructor D. J. Deasy. Ninety students worked 8 days to complete the stretchers, which were A-1 in workmanship (see picture on page 84). But what about all the other big cities, and the innumerable smaller cities? Certainly, the USO centers throughout the country can also use whatever you can turn out in the way of games, gadgets and novelties.

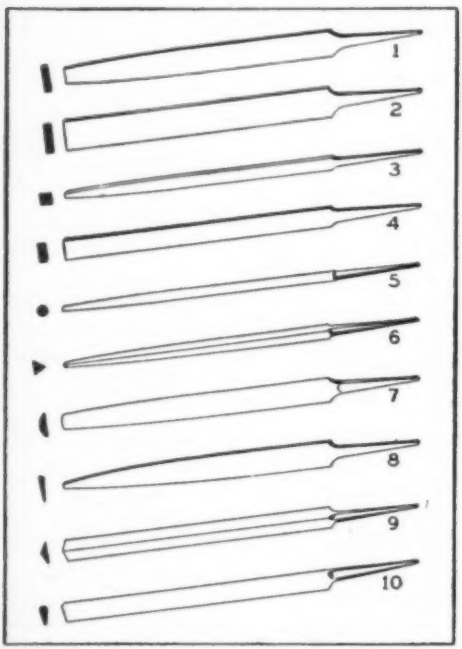
Two million and more men of the armed forces can use a real heap of chess and checker boards, shuffleboards, dart-throwers, ring-toss and other games, as well as Red Cross equipment. This is just one idea for a starter. Then there are other needed articles, such as small bookcases and writing tables. Countless types of personal articles wrought in leather or metalcraft suggest themselves. In fact, in whatever medium you prefer, whether it is wood, steel, metal, clay or leather, there is some article which you can construct or fashion that will bring pleasure to the men in the camps.

It is said that twenty men arrayed on the vast second battle front of Production are required to keep one man in fighting shape on the battle lines. The school shop students, and the home-workshop mechanics belong to the great reserves of the civilian army of production. The initiative taken by Chicago will no doubt be followed by schools all over the country. However, this is in no way only a school shop matter. Every reader who owns the simplest kit of tools will likewise rally to the "building-it-yourself" campaign for the USO. Here, definitely, is one production job in which everyone can take part.

Send your completed projects to the nearest USO office or training camp. School shop students can especially speed up this program by bringing this information to the attention of their shop instructors so that periods of time can be provided for actual production work in the school shops where, generally, superior facilities are available. This is a rare assignment, but one on which every school-shopper will turn in a perfect score!

Meanwhile, this department will keep its ear to the ground as usual and bring you news of what progress is being made in this direction. First, however, you must let us know about your own activities, what you have built for the USO and any idea for a game or project which might be passed on to others. Let's go!

HOW MANY OF THESE FILES CAN YOU IDENTIFY?



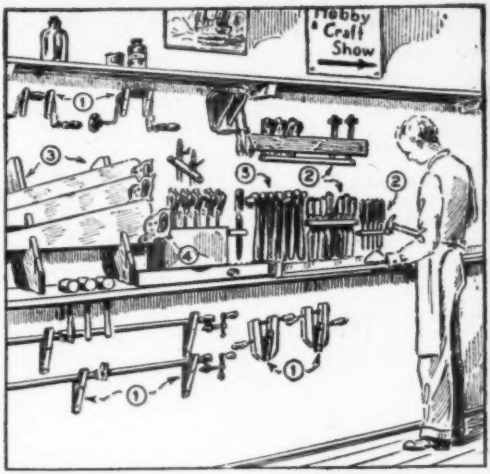
This month's Craft Test is fairly easy, for a change. You shouldn't have much trouble naming these files. Score ten points for each correct answer. If you don't make 70 you'd better run down to the hardware store for a lesson. Answers on page 174.

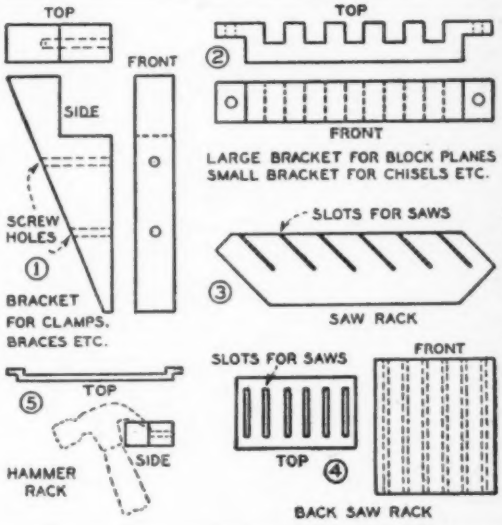
Tool Racks For The School Shop

THE development of skill in the use of tools is only one of the educational objectives of a school shop program. Desirable habits and attitudes of methods and shop practice are also important educational aims. In order that these objectives may be more easily realized, the shop setup itself must create the stimulus and set the example for efficiency in performing the many detailed secondary tasks necessary for good results.

Neat, orderly tool racks contribute greatly to the working efficiency and resulting project output of the shop, and encourage neatness and a sense of responsibility in the care and use of shop equipment. Such a system of tool arrangement also insures better care of the tools and their cutting edges. Illustrated at right are a few substantial tool racks and brackets which are simple to make and will give good service.

Even if your particular manual training workroom has good tool racks you may get ideas for improving them from this drawing. The top part of the sketch shows a suggested arrangement of the racks above and below the workbench, while details of each rack is shown beneath with an identifying number. Needless to say, the racks should always be firmly screwed to their supporting surface—never nailed.—*Roger M. Woodbury,* Lynnfield Center (Mass.) School.





STUDENTS' PROBLEM BOX

1—Q. I read recently about a certain chemical which serves a great variety of cleaning purposes. Can you tell me its name?
A. The name is trisodium phosphate, or TSP, as it is conveniently called. TSP is about the most versatile of all cleaning agents for use in home and shop. It may be purchased in paint stores, cheaply.

2—Q. Is there some manner of rustproofing nuts which are exposed to the weather.
A. Yes. You may use any good grade of roofing cement. The cement forms a soft protective coating which comes off easily when the nut is to be removed.

3—Q. How can tapered work be held securely in a swivel-jawed vise?
A. This may be done by inserting a coarse file between the work and the vise jaw. It is advisable to protect the file by using a false copper jaw on the vise.

4—Q. What is the best type of straight edge to use when cutting glass?
A. Flat, metal curtain rod is superior to ordinary wooden rulers for this purpose. It does not have a tendency to impede free movement of the cutter, and with slight pressure remains in position on the glass.

5—Q. After friction tape is wrapped around a wire as insulation, it is frequently hard to pull the joint through a narrow opening due to the adhesiveness of the tape. How can this "tackiness" of the tape be overcome?
A. The tackiness of the tape can be removed if the outside of the tape joint is sufficiently sprinkled with talcum powder.

6—Q. What textbook would you recommend for a beginner in radio?
A. The clearest presentation of radio theory and practice may be found in Gerhardi's "Applied Radio Physics." An excellent companion volume is "Modern Radio Servicing" by the same author.

7—Q. How may a broken automobile headlamp bulb be removed?
A. Use a spring-type clothespin, compressing the handles of the pin and inserting them into the bulb socket. The bulb may then be screwed out.

MI SHOP SCRAPBOOK INFORMATION SHEET

HOW TO DO WOOD FINISHING

There are six ways to finish wood, whatever the particular work may be. You may finish it by one of the following methods:

PLAIN: First smooth the wood off with a medium sandpaper, then a fine sandpaper, and finally the finest available sandpaper. This process will yield a rich, velvety finish.

OIL: Smooth the surface with fine sandpaper; then moisten a pad of cotton or cloth with raw linseed oil, and cover this with a soft piece of linen. Use just enough oil so that the pad may be rubbed smoothly over the wood surface.

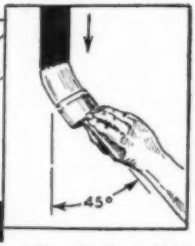
VARNISH: Always apply varnish in a dust-free room. To remove all dust or dirt particles from the wood surface, clean with a rag moistened with turpentine. Varnish should be used as it comes from the can; thinning may cause it to lose its luster. When applying use a good *varnish* brush, taking care to spread the varnish evenly. Do not apply a second coat before 24 hours.

LACQUER: Remove all vestiges of varnish, stain or paint from the surface to be lacquered. Brush on lacquer with a soft fitch or camel's-hair brush. Only special lacquer thinners should be used when necessary. Allow 4 to 6 hours between successive coats.

SHELLAC: Apply first coat by adding ½ alcohol. Use a rubberset brush with medium-sized bristles. Always brush from top of work downwards and with the grain. Allow 4 hours for drying, then rub down with fine sandpaper, or preferably fine steel wool. In applying added coats use more shellac and less alcohol. For best results, apply three or four coats.

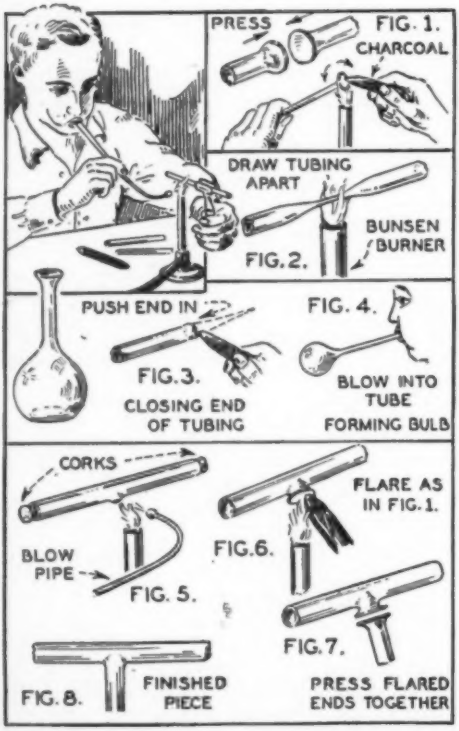
WAX: Before a surface is ready for waxing, see that the shellac, varnish or lacquer surface is well dried. Apply small amounts of wax with a soft cloth. Allow the wax to dry for about 20 minutes, and then rub briskly with a soft cloth. Finish rubbing with the grain.

Hold brush at 45° angle to work and stroke as above, for horizontal surface.



45° angle also used for vertical surface, but stroke should be downward.

Glass-Blowing Is Easy



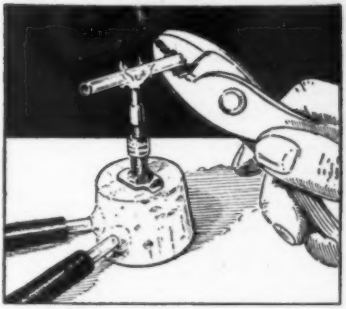
TO DEVELOP into a competent glass-blower does not require the length of experience and practice generally supposed. Beginning with a few pieces of necessary equipment, one can learn to make useful objects such as flasks, etc., in short order. No long years devoted to the art are necessary, either, before one can turn out decorative pieces. The basic "tricks of the trade" may be reduced to a few simple instructions, given herein.

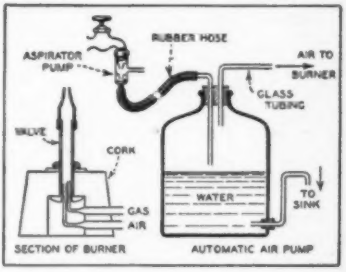
A source of intense heat for softening the glass so that it will become pliable is provided in the Bunsen burner, which constitutes the principal item of your glass-blowing paraphernalia. Next, comes the blowpipe, which is simply a brass tube tapered to a fine point at one end to provide sensitive control of the air pressure blown through it from the operator's mouth. With these, several sticks of charcoal, some lengths of glass tubing, and one is prepared for a few simple, beginners' operations.

Suppose you wish to bend a length of glass tubing for the purpose of making a siphon. First cork one end of the tube and heat it near the top of the Bunsen flame at the point at which you wish to produce a bend. Turn the tubing constantly while heating so that the tube will heat evenly on all sides. When the tube reaches a dull red color it will bend of its own weight. However, the bend produced in this manner will be flat, which is not desirable. To prevent this, the tube should continue to be heated up to a bright red; then, placing the open end of the tube in the mouth, blow a little pressure of air into the tube. This compression of air in the tube prevents it from collapsing, and the tube may now be bent to any angle, gently.

To join two lengths of glass tubing, heat one

Make This Micro-Burner For Glass-Blowing





AN EXCELLENT micro-burner for glass-blowing, utilizing compressed air and gas, can be made from an old bicycle valve, glass tubing, and a large cork or rubber stopper. A piece of glass tubing several inches long should be heated at the center and drawn out slightly to reduce the diameter. Cut the tubing in the middle with a file and bend up the capillary portions at a right angle. These two tubes are the gas and air inlets.

Remove the inner parts of the valve leaving only the shell, then mount it on a cork as shown in the diagram. Slits cut in the cork allow the pieces of bent tubing to be inserted, extending up into the valve shell. All holes are filled with plastic wood or sealing wax, both to support the tubing and prevent the leakage of gas.

Compressed air may be supplied either from a foot bellows, or from an automatic device using water pressure to build up a continuous supply of forced air. For this latter device a large gallon-size bottle having a hole near the bottom (known as an *aspirator bottle*), some lengths of glass tubing, and a small metal gadget which screws onto a water tap (called an *aspirator pump*), are needed. The aspirator pump can be obtained quite cheaply from a scientific supply company. Sometimes it is stocked by photographic dealers.

Two pieces of glass tubing are inserted into a cork in which two holes have been bored (and the cork pushed into the mouth of the bottle). One of these tubes is attached to the aspirator pump through a length of rubber tubing. From the

[*Continued on page* 166]

end of each tube to a bright yellow and insert a pointed piece of charcoal in the opening. Then twirl the charcoal about until each end of the tube has a large flare, Fig. 1. Now heat both tubes to a dull red and bring both ends together, pressing lightly. As soon as they are making good contact, heat this joint very hot and pull slightly to bring the flares into shape.

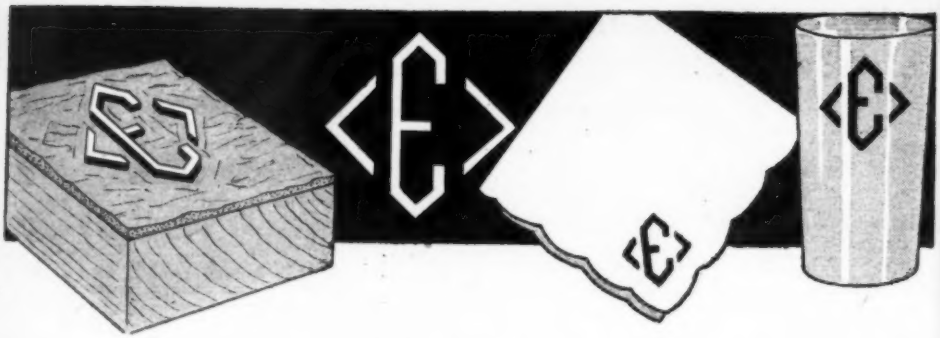
To make a bulb at one end of a tube, heat a portion of tube and draw it apart, Fig. 2. Each end will be tapered. This point, of one piece, is now to be pressed into the tube with a piece of charcoal until closed, flattened and as thick as the rest of the tube, Fig. 3. Placing this end over the flame, heat an inch or more until white hot and turn the tube continually to prevent bending of its own weight. When the glass is thus brought to a very hot condition, blow a sudden puff into the open end. This will expand the hot end into a bulb whose size will depend upon the amount of air blown into it, Fig. 4. (Knowing just how hard to blow in different instances will be acquired with experience.) The base of the bulb is flattened by setting it, while hot, on a flat piece of charcoal. In this manner, spherical shapes are produced, and modifications made.

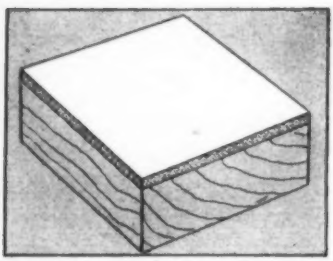
Knowing how to make a T-joint is also a bit of technique which one should learn, as it is a basic form which finds many applications in glass-figure forming. Tightly cork both ends, and gradually warm the entire length of a tube near the flame. When warmed, blow through the blowpipe onto the top of the Bunsen flame in such manner as to direct a small flame to a spot on one side of the tube. As this spot heats up, the expanding air within the tube will blow out through the softened spot, leaving a small puncture, Fig. 5.

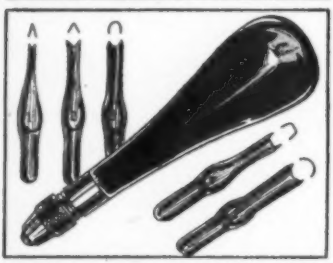
[*Continued on page* 166]

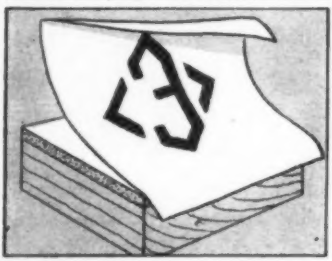
The School Reporter Says:

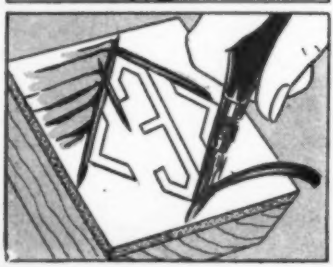
REPORTING from Canada are R. W. George, Victoria High School telling us about the excellent shop facilities there; Henry Englebrecht, Rosthern Academy, Saskatchewan, reporting on a small shop group with extensive shop equipment, and, last but not least, Ed Wiebe, who writes enthusiastically about the 12' by 20' workshop conducted by Mr. Schroeder, the instructor who supervised the shop's construction two years ago. For two successive years this shop has won Achievement prizes in competition with other rural schools. Located in Schoenan, Altona, this shop is open for students' use evenings as well as Saturdays . . . Ralph G. Sabee of Brooklyn Automotive Trades School says that the auto shops are designated as Front End Shops, Rear End Shops, and Chassis Shops . . . Bert Wilson attends the Industrial Arts course at Hamilton High in Hamilton, Ohio. Over five hundred students take courses in mechanical drawing, wood and wood-lathe work, and paint shop . . . MI and the SS have a real enthusiast in Anton Caruk, also of Canada, Mundare to be exact. He complains of the traveling time necessary for MI to reach his home town. However, he tells an anecdote about the "new boy" in the class who was asked by the instructor to get a try-square from the tool rack. The boy came back with a ball-peen hammer. This certainly shows that there's lots one can learn about tools . . . Too bad we can't print all those interesting letters in full. New members of the "SS" Reporters staff: Mel Olswanger, Jr., Memphis; Ephrem Carrier, Grand Falls, N. B.; Edward Davis, Houston, Texas; Gustav Wellson, Farmingdale, H. S.; William Farndon, Niagra Vocational School, Niagara, Wis.











HOW TO MAKE

by Rod Emery

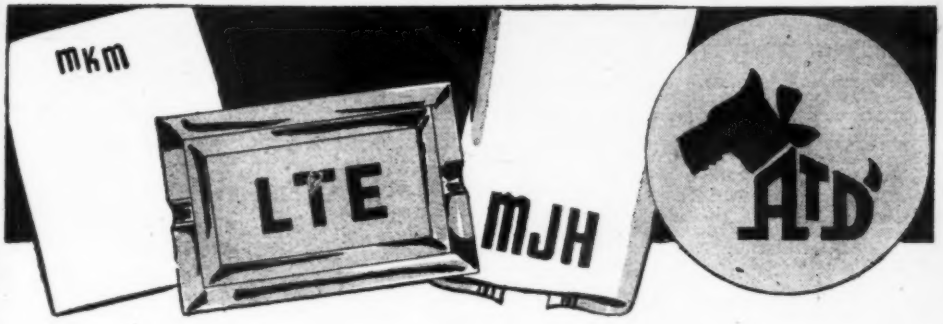
YOU don't have to sit around and envy the Smiths because they serve you cocktails accompanied by initialed or monogrammed napkins, doilies, coasters, ash trays and glasses. If you think your drinks will taste better when presented with such embellishments, you can make your own monogram, design or initials at a cost of approximately one dollar—and with very little labor or trouble.

Glasses, cocktail and dinner napkins, ash trays, towels, coasters, stationery and personal clothing can be personalized with a modern version of the old-time linoleum block method of printing. While not new, this method of printing has been adapted by the writer to serve any number of uses around the house, and the result has been equal to or better than the commercial product. My own napkins, guest towels, coasters and ash trays have excited so much comment that I have even been able to do a sizable printing business among my immediate associates and acquaintances.

To print monograms and initials in this way, you will need a linoleum block, cutting tool and blades, ink, a roller and some clean white paper.

The linoleum block can be bought at any store dealing in artists' materials. It costs about 10 cents, measures 2"x3" and has a white surface. As a matter of fact, any linoleum can be used, so long as it has a surface free from dents, cuts and scratches. If the latter alternative is accepted, be sure the linoleum is glued to a wooden block and the surface coated with white poster color (water color). When the cutting on the block is finished, the water color can be washed off very easily with a bit of cotton dipped in clean water.

The best type of cutter is one made and sold by the Speedball company, manufacturers of artists' supplies. It sells for 50 cents and comes with a cutter handle and five different liners and gauges (see sketch). However, if



A *LINOGRAM*

LINOGRAMS are monograms cut in linoleum blocks and printed upon almost any desired object. They're easy and they're fun. Try one!

you are unable to obtain this type of tool, a sharp knife or razor blade set on a handle will do the job just as well.

Block print ink is sold in tube form for approximately 25 cents a tube, and one tube should be enough for about 2,000 printings, depending on the size of the monogram or design. There is a water soluble ink as well as an oil ink, but the latter—because it will not wash off—is preferable for almost all uses. The roller (or brayer) also can be obtained in most art stores and sells for from 15 to 25 cents.

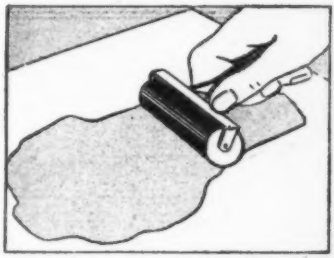
Now to get started: Draw or trace the type of monogram you think you'd like to have on tracing paper or thin bond, using a soft pencil. Next put the side of the paper on which the design has been drawn against the white surface of the linoleum block, and either rub down hard on the paper with a smooth-surfaced object or go over the design with a hard pencil. The idea is that the penciled design should be transferred from the paper to the linoleum block. It must appear in *reverse*, of course, ready for printing.

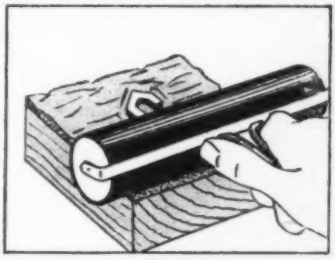
Before starting to cut, however, be sure to go over the design with a soft pencil. Then you will know that every part of the surface which has no pencil mark is to be cut away.

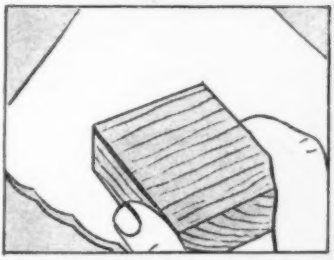
Now you are ready to begin cutting. Use the No. 1 cutter for fine lines and detail, cutting to a depth of 1/16th of an inch. Then use the large, No. 2 cutter to get deeper into the linoleum. *Do not* cut deeper than 1/8th inch, however, for, if you do, you will weaken the design area which is left uncut. Use the most convenient shape and size gouge to clear away the large spaces, learning the most efficient method by process of experiment.

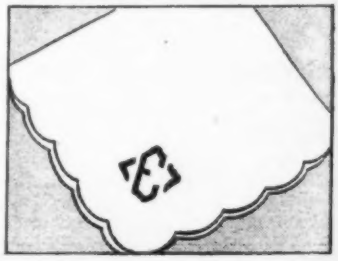
The actual printing is simple and a lot of fun. Squeeze out a small amount of the ink onto a piece of glass or a marble slab, spreading it out with the roller. Then, while

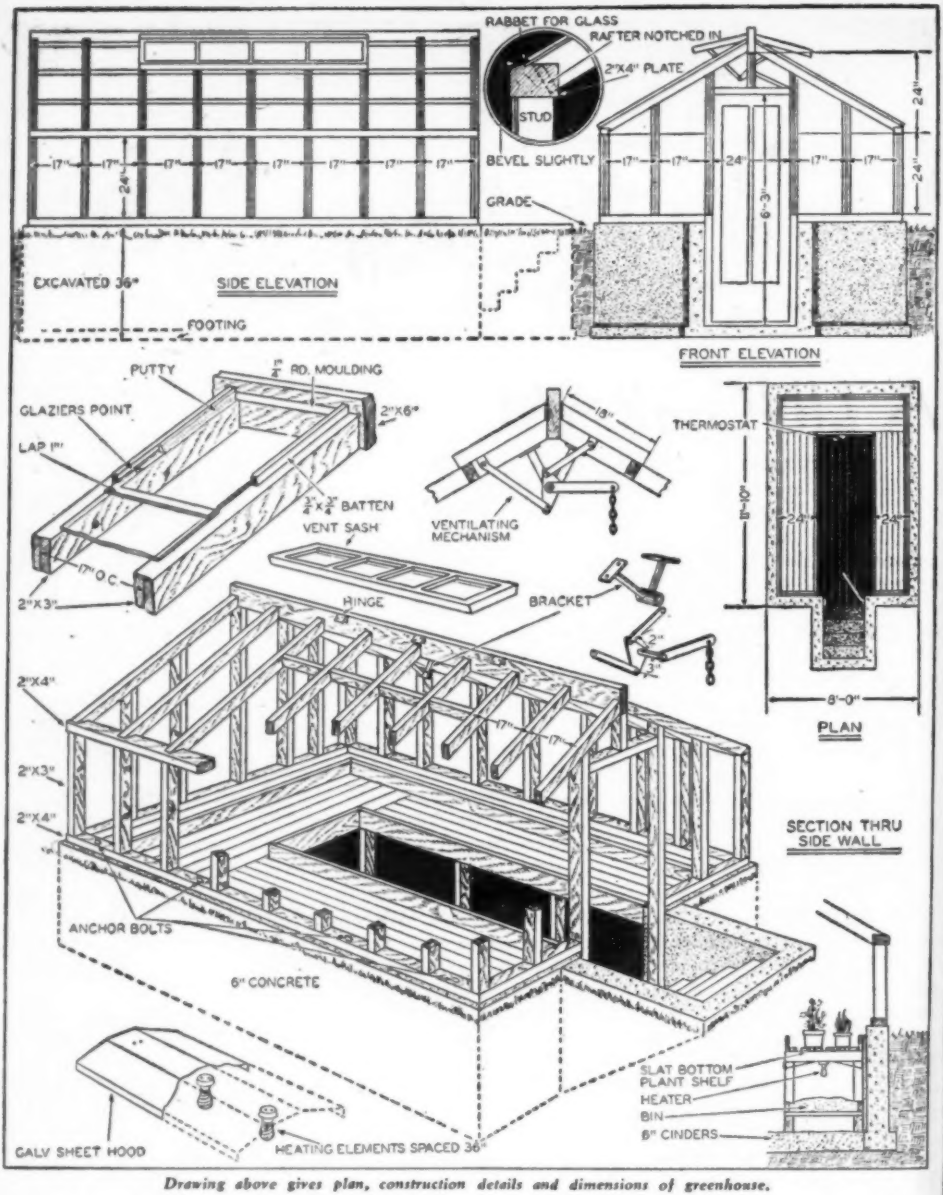
[*Continued on page* 176]











Drawing above gives plan, construction details and dimensions of greenhouse.

Small Garden Greenhouse

[*Continued from page* 111]

electrical heating units under a galvanized hood, which protects them from the sprinkling. If galvanized sheet is not available, use black iron and paint the upper surface to prevent rust. Degree of heat is controlled by a thermostat located as shown in the plan view.

There is space beneath the heater and bench for bins to accommodate leaf mold, sand, fertilizer, extra pots and the like. This size and design of small greenhouse has been successfully tried out in the west over a long period; in California most of them are above ground, but in the snow-belt an excavation is recommended.

A list of materials for greenhouse will be found on page 174.

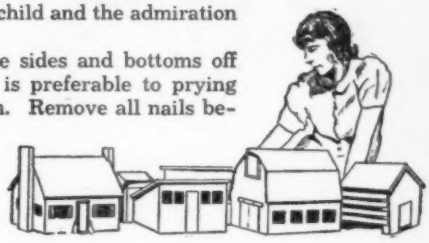
MODEL FARM BUILDINGS

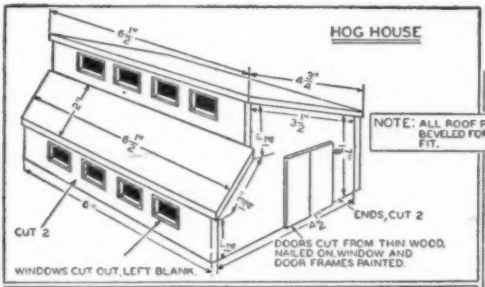
Made From Fruit Crates

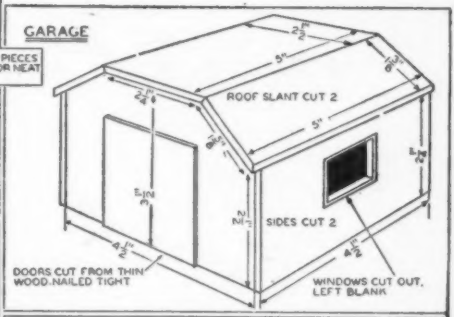
WHAT young farmer wouldn't enjoy a model farm to house his animals and machinery? This one is easy to make, requiring only the simplest hand tools, fruit crate "lumber" and elementary skill. But the finished buildings are attractive enough to win the heart of any child and the admiration of the older folks.

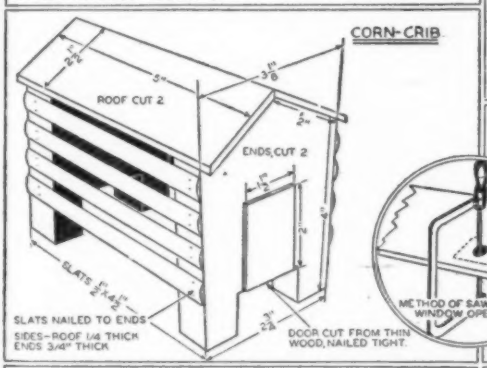
Knock down several fruit crates by sawing the sides and bottoms off the ends. This method of removing the boards is preferable to prying them off, for the latter method is apt to split them. Remove all nails before doing any sawing of the building parts.

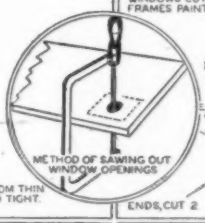
[*Continued on page* 168]

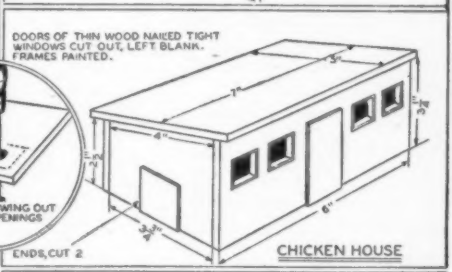


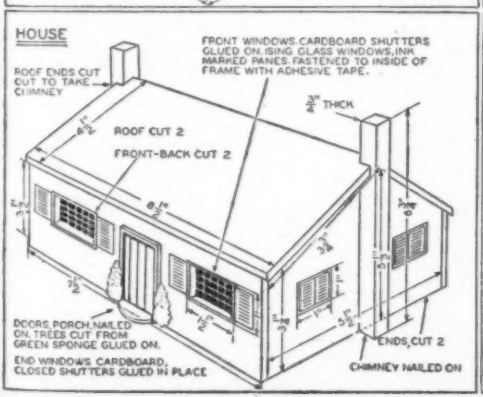

HOG HOUSE
NOTE: ALL ROOF PIECES BEVELED FOR NEAT FIT.
ENDS, CUT 2
CUT 2
DOORS CUT FROM THIN WOOD, NAILED ON WINDOW AND DOOR FRAMES PAINTED.
WINDOWS CUT OUT, LEFT BLANK.

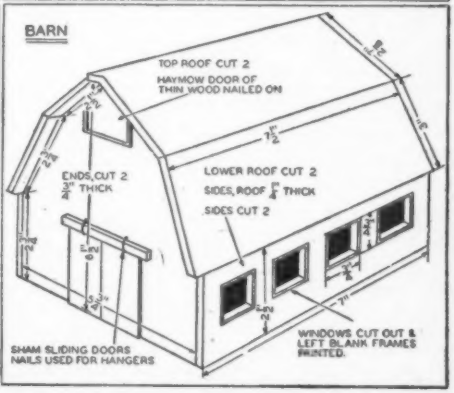




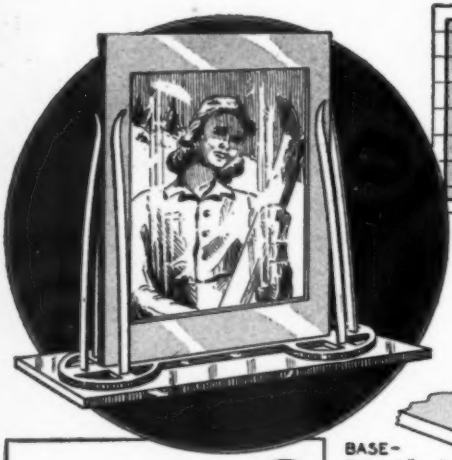


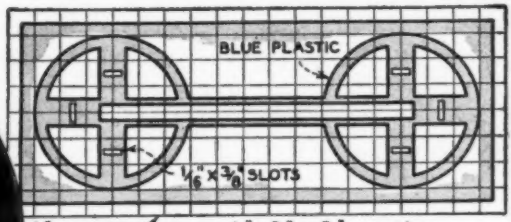


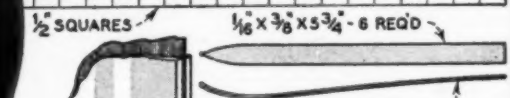

HOUSE
ROOF ENDS CUT OUT TO TAKE CHIMNEY
FRONT WINDOWS CARDBOARD SHUTTERS GLUED ON. ISING GLASS WINDOWS, INK MARKED PANES. FASTENED TO INSIDE OF FRAME WITH ADHESIVE TAPE.
ROOF CUT 2
FRONT-BACK CUT 2
DOORS PORCH NAILED ON. TREES CUT FROM GREEN SPONGE GLUED ON.
END WINDOWS CARDBOARD, CLOSED SHUTTERS GLUED IN PLACE
ENDS, CUT 2
CHIMNEY NAILED ON

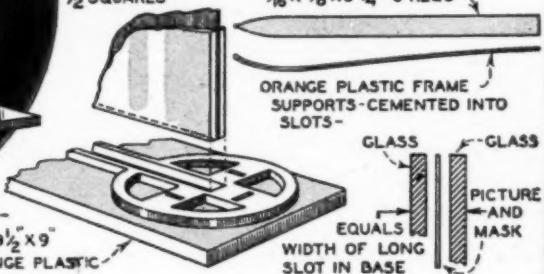

BARN
TOP ROOF CUT 2
HAYMOW DOOR OF THIN WOOD NAILED ON
ENDS, CUT 2
LOWER ROOF CUT 2
SIDES, ROOF
SIDES CUT 2
SHAM SLIDING DOORS NAILS USED FOR HANGERS
WINDOWS CUT OUT & LEFT BLANK FRAMES PAINTED.

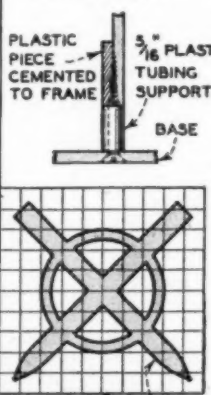
Frames For Winter Snapshots

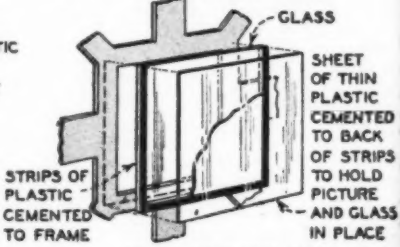




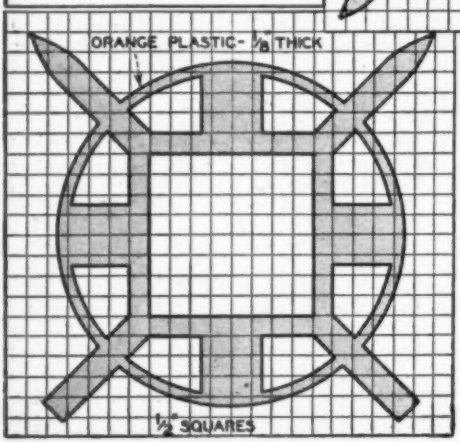







GLASS
SHEET OF THIN PLASTIC CEMENTED TO BACK OF STRIPS TO HOLD PICTURE AND GLASS IN PLACE
STRIPS OF PLASTIC CEMENTED TO FRAME

DETAIL OF FRAME BACK.



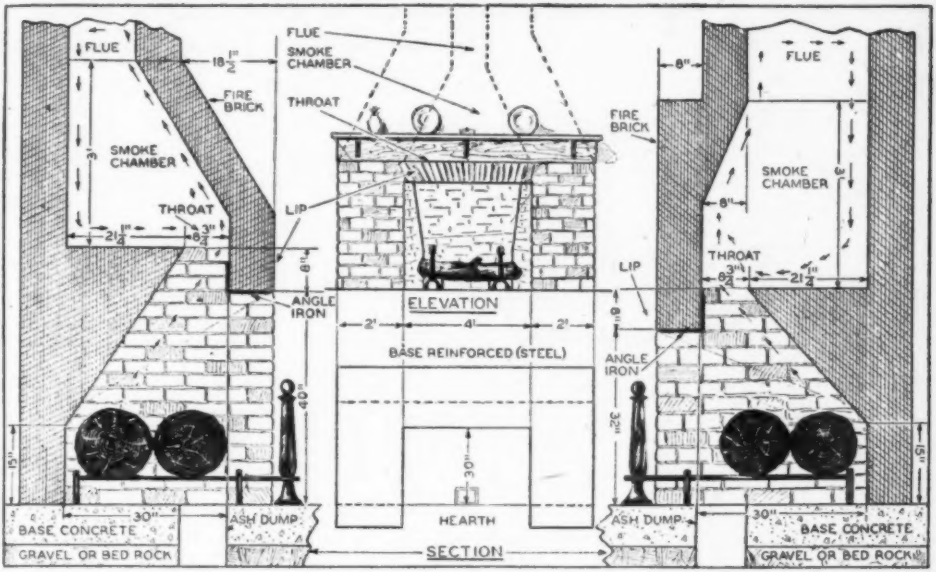
BLACK PLASTIC 1/16" OR 1/8" THICK

CONSTRUCTED from colorful plastic, these attractive frames are easily made up and will display your favorite ski pictures or other winter snaps in atmosphere symbolic of the season. From the graph illustrations may be outlined all the necessary designs in any desired size. They are cut out from translucent plastic on a jigsaw, employing a fine blade. From these graphs may also be determined proper amount of bend to give the miniature ski supports which is accomplished by heating the plastic in hot water and forming the bend which will become set when the plastic cools.

The layout illustrations also show the arrangement and method of assembling the frames. A translucent plastic is most suitable for these projects and the color combination indicated is very attractive; however, it may/

[*Continued on page 174*]

The Practical Fireplace



Here's how to make a fireplace that will throw heat instead of smoke.

by Duncan P. Smith

THERE is no addition to the home or cabin which can hold quite the comfort and cheeriness of a well-built fireplace. For ages it has been the symbol of hospitality and goodwill. The greater part of its good qualities are lost when a fireplace insists on belching quantities of smoke into the room. Careful construction, however, can eliminate this unpleasant feature, found in many fireplaces.

The reader may think that the every-day mason is well versed in the building of this age-old source of heat. He is the exception rather than the rule. Through examination, it will be found that a large number of fireplaces in the average home or cabin are not properly constructed.

Careful consideration must be given to the following points: The throat size. The lip. The step. The correct flue dimensions. Failure to regard the importance of these four items will result in disappointment. The dimensions of the accompanying sketch are somewhat larger than the average fireplace. This is the plan of the fireplace in my mountain cabin. Ten tons of broken granite rock with a liner of brick throughout were used in its construction. The firebox length was a bit longer than the sketch; ample for four foot wood.

Materials

Several kinds of material are necessary; brick, rock (if such is to be used for facing), Portland cement, lime and sand. Often flue liners of smooth baked clay are used, but are not essential. It will take forty or fifty firebricks or their equivalent in fireclay for the firebox. Two pieces of angle iron should be used to support the arch. In my fireplace, because of the great weight, it was necessary to use two pieces of railroad steel. Light angle iron is very suitable if the fireplace is to be built of brick throughout.

The Base

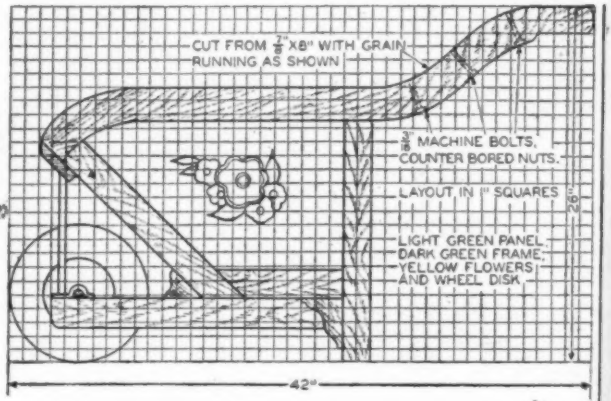
The thickness of the base must be determined by the type of earth and the weight to be sustained. In most cases one foot is sufficient. Its dimensions should be somewhat greater than the over-all of the fireplace proper. This will give additional footing

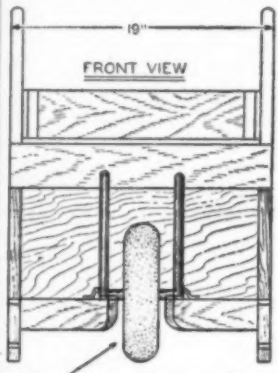
[*Continued on page* 170]

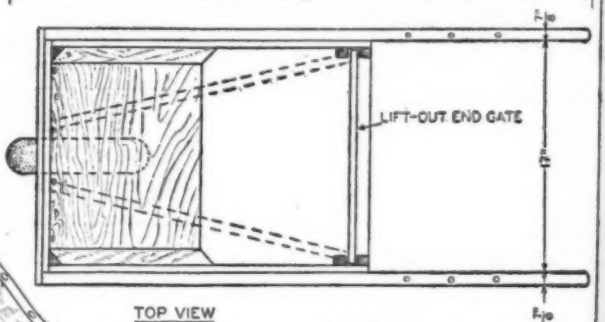
GARDEN BARROW

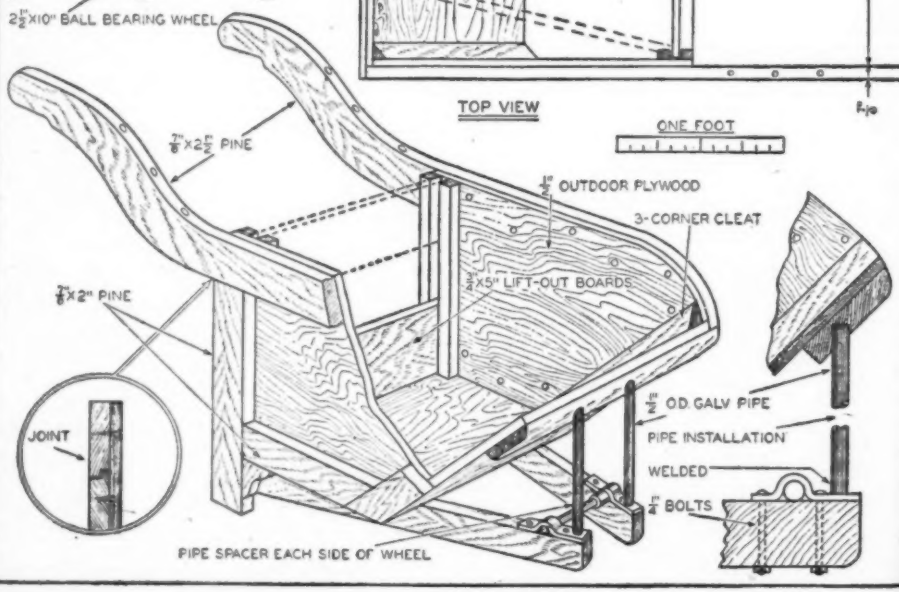
BUILT of half-inch waterproof plywood with pine framing, this light garden barrow has ample capacity for ordinary needs and is easy to fill and dump. Removable end-gate boards slip down between battens, and the design brings much of the weight forward so that a woman can handle it.

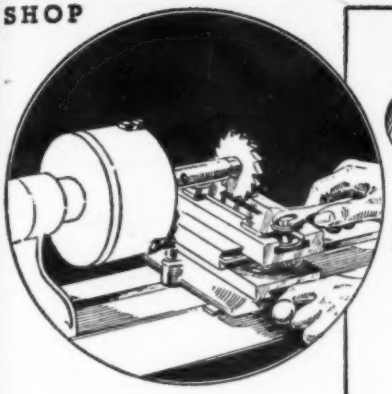
[*Continued on page 174*]


CUT FROM ¾" X8" WITH GRAIN RUNNING AS SHOWN
⅜" MACHINE BOLTS, COUNTER BORED NUTS.
LAYOUT IN 1" SQUARES
LIGHT GREEN PANEL, DARK GREEN FRAME, YELLOW FLOWERS AND WHEEL DISK
42"
20"







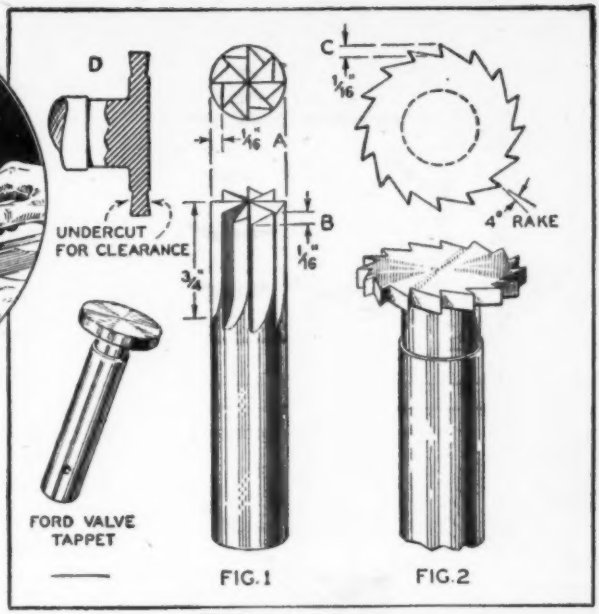


Home Made Milling Cutters

SMALL milling cutters can easily be turned out in the home shop from model "T" Ford valve tappets. These can be purchased for a few cents each from almost any auto wreckers and if carefully made according to the accompanying drawings will be found to be very serviceable.

Fig. 1 shows a very useful end mill made in this manner. The head of the tappet is first cut off and the end of the shank faced up true in the lathe. The end cutting teeth are then marked off as shown in (A) and filed down about $\frac{1}{2}$" as at (B). Care should be taken in the filing to ensure all of the teeth being in the same plane. The sides are then

[*Continued on page* 176]



Shop Rack From Cable Reel

A USEFUL and versatile bench holder can be made in a few moments from one of the metal reels or spools on which large wire or automotive cable is usually coiled. Only one operation, that of bending one of the end disks of the spool as indicated, is required to complete the holder. It may be secured to the bench top by screws or bolts if desired, but this is not really necessary because the large area of the base flange or disk is sufficient to keep it from tipping in use.

A useful application for this stand is shown in the center sketch where it is shown holding a generator armature for repairing or testing. The springiness of the sides of the disk grip the armature core firmly and prevents it from moving until shifted by the operator. At top it acts as a heating stand for the soldering bit. The large metal area tends to radiate enough heat from the head of the bit while it is in the stand to prevent burnout of the element even when left on for long periods without actual soldering being done.

[*Continued on page* 176]

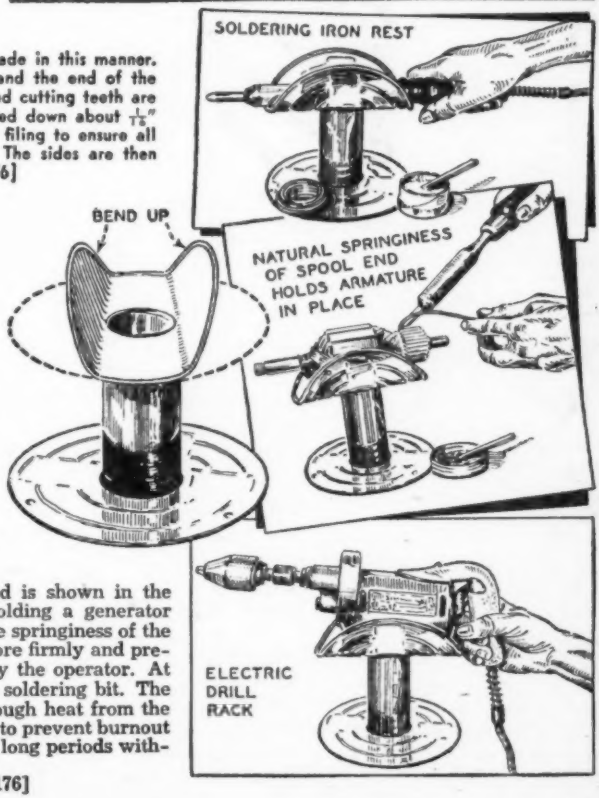


FIG. 2

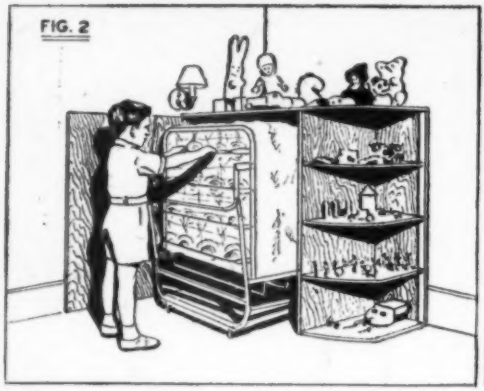
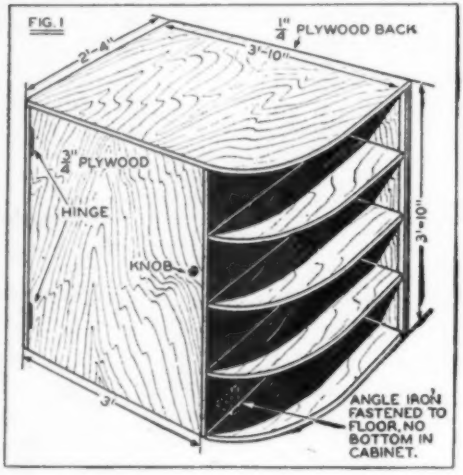


FIG. 3

FIG. 1



Hide That Bed!

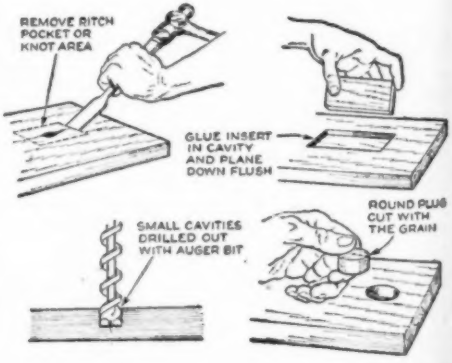
DOES your child's bedroom need more play space? One way to gain it is to get the bed out of the way during the daytime. This is not as impossible as it may sound; the drawings above and at left show just how it can be easily and inexpensively accomplished. The idea is particularly applicable to small apartments where floor room is at a premium.

A bed cabinet encloses a roll-out folding bed which is completely concealed in a minimum of space when not in use. The cabinet has attractive shelves at one side which keep playthings within easy reach, and more toys can be placed on top.

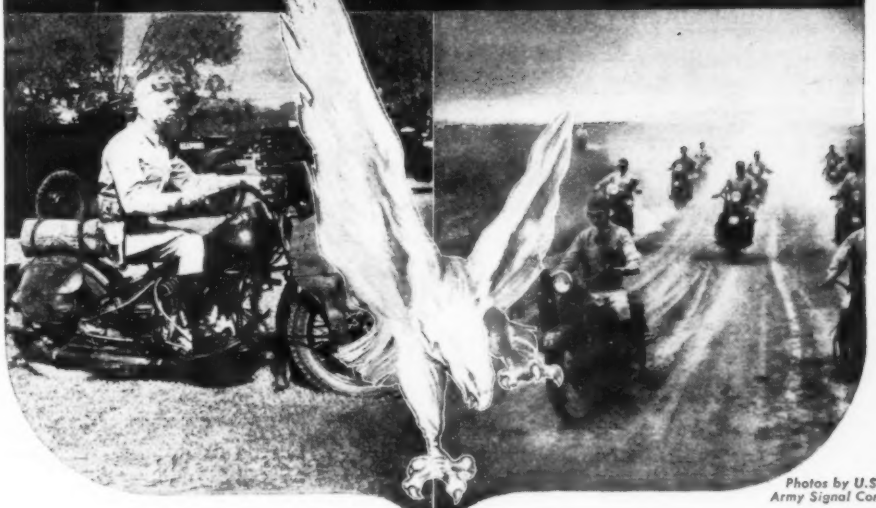
Construction is simple, consisting of a pine frame over which the plywood exterior is nailed or screwed. The dimensions given should naturally be varied to suit the particular bed employed. Hinge the door with ordinary cabinet hinges and install a 10c bullet catch at the other edge, just below the knob. Finish with stain or paint to match the room's decorations.—*M. R. Aldrich.*

Eliminating Flaws From Pine Boards

KNOTS and large pitch pockets can be eliminated from the face side of pine boards by cutting out the undesirable portions and gluing straight grained pieces in their places. Plugs for square shaped cavities can be cut from scrap pieces of pine by chiseling or planing them to size. Cavities which have been drilled out with an auger bit can be filled with ready-made round plugs such as cider barrel plugs, floor plugs, or stair rail plugs. Floor plugs measure 3/4" in diameter, stair rail plugs 1", and barrel plugs are sold in an assortment of sizes. All are cut out "with the grain," making them preferable to plugs out "across the grain" from dowel rod, broom sticks, etc., which present the problem of sealing and finishing the visible end grain.


REMOVE PITCH POCKET OR KNOT AREA
GLUE INSERT IN CAVITY AND PLANE DOWN FLUSH
SMALL CAVITIES DRILLED OUT WITH AUGER BIT
ROUND PLUG CUT WITH THE GRAIN

Enlisted IN FREEDOM'S FIGHT



Photos by U.S. Army Signal Corps.

OFF the assembly line they roll — sleek, streamlined Harley-Davidson motorcycles for Uncle Sam's forces and the armies of our Allies.

Today's Harley-Davidson Motorcycles are duplicating the splendid record made by their predecessors back in World War I. The hard-riding scouts who lead the advance of armored divisions to reconnoiter, spot mines, traps and ambushes, report on road conditions and enemy movements, *know* that the sturdy construction of their mounts will not let them down. They *know*, as thousands of civilian riders *know*, that Harley-Davidsons' dependability is an inbuilt quality that makes them equal to any task assigned to them.

See your Harley-Davidson dealer. Let him tell you about the superior performance of these world champion motorcycles. Look over his special values in reconditioned models.

HARLEY-DAVIDSON MOTORCYCLES

ON AMERICA'S FRONT LINE OF ACTION

Send this Coupon NOW

HARLEY-DAVIDSON MOTOR CO., Dept. MI, Milwaukee, Wisconsin

Send FREE copy of big 24-page "Enthusiast" magazine filled with thrilling motorcycle pictures and stories. Also literature on the latest Harley-Davidsons. Stamp is enclosed for mailing cost.

Name .....

Address .....

What's Your Car Trouble?

If you have a problem with your car, ask Mr. Russell. Just send stamped, self-addressed envelope for a personal reply.

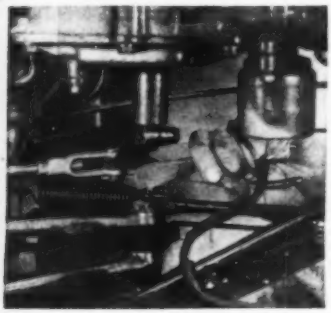
by Frederick C. Russell

What is the best way to de-choke an engine? J. L. B.

Press the accelerator slowly to the floor. Hold it there while cranking for about ten seconds.

Ever since having the starter-motor repaired my car won't go over 40 miles an hour. How could the starter affect car speed? S. L. M.

Evidently the service man pressed against the air cleaner, moving it enough to cramp the throttle control.



Occasionally there is definite resistance in the gear shift, but inspection of the shifter forks in the transmission shows that all is well here. What do you think is wrong? H. B. E.

A cotter pin in one of the gear shift control rod clevises is catching in the brake pedal return spring.

What would cause one of the brakes' shoes to wear more than the others? On my car the shoes are supposed to press equally. D. W.

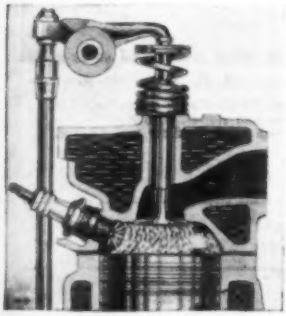
The return spring for that particular brake shoe is weak, allowing the shoe to drag.

I have been told that I can get a better start by resetting the spark plug gaps closer. Is that reasonable? J. M. McK.

Yes, this helps compensate for a weak battery. If the coil is weak the closer points improve high speed operation.

I do not believe that the shocks on my car control rebound properly. How can I test this? S. M. L.

Always let me know the make and year of car you drive because, in your case, perhaps the shock absorbers are not of the two-way variety. Assuming they are two-way I suggest that you have the car raised on a lift and then pull down on one of the bumpers. Note the resistance to spring compression. Then immediately push up to note resistance. If the body rebounds too easily the shocks need attention.



In replacing the clutch plate should I use one with a wider facing? L. U. S.

Not unless you make sure to have ridges removed from the flywheel face. If this isn't done the new facing will chatter. A grinder should be used for removing the ridges made by the old facing.

What would cause the valves to burn often? They have enough clearance. C. K.

Valve springs are weak and should be replaced. Accompanying cross-section shows normal spring holding valve closed and protecting it against flame under its head.

but here is one worry you can avoid

WITH taxes going *up* this year, you'll want other expenses to come *down!* So take *extra* care to avoid *extra* wear on your car's king pins, tie rods, steering crank bearings and other vital friction points that means costly repair bills when neglected! Play safe —with Marfak bumper-to-bumper *chassis lubrication* every 1,000 miles!

Marfak is scientifically applied by *chart,* not by chance. It is *super-tough* . . . contains heavy-bodied oils . . . and resists wear-out, wash-out and squeeze-out!

Do you want your car to "ride like new"? Do you want extra miles of quieter, smoother performance? Then never say "grease-job". Insist on Marfak 40-point lubrication! At Texaco and other good dealers everywhere.

TUNE IN

FRED ALLEN every Sunday night; **METROPOLITAN OPERA** every Saturday afternoon. See your local newspaper for time and station.

You're Welcome at **TEXACO DEALERS**

YOU Can Win CASH, Too!

ON PAGES 66-75 appear pictures of valuable prizes as they are to be given free to readers of MECHANIX ILLUSTRATED. You probably know all about the big contest by now, but you must have several friends who would like to know about the "Words-Within-Words" game and the valuable prizes, too.

There are enough prizes for all, so why not make a list of friends you know will be interested in this contest and who you believe have the skill with which to win?

By so doing, you may win one hundred dollars, cash!

See your friends personally, telephone them, or send them one of the coupons at the bottom of this page. Be sure they put YOUR NAME on the contest entry blank as sponsor.

That's all you have to do!

If one of your friends wins a prize, YOU, as his or her sponsor, will be eligible for a *cash* prize for having introduced a prize winner to the contest.

The person who sponsors the winner of the biggest prize will receive $100. The sponsor of the individual winning the second largest prize will get $50. The sponsor of the winner of the third largest prize will get $25. In addition, there are five more prizes of $5 each.

That doesn't mean you have to sponsor the winner of the 1st prize (an Aeronca airplane) to win $100. The winner of the first prize may not have a sponsor. The $100 may be won by someone sponsoring a minor prize winner!

Sponsoring one or more of your friends does not injure your chances of winning a prize in the "Words-Within-Words" contest, but gives you a chance to take in a CASH PRIZE as well as one of the big contest prizes.

All you have to do is let your friends in on this big contest. Tell them to put you down as their sponsor and you automatically become eligible for a cash sponsorship prize!

Be sure, though, that you, as sponsor, select entrants skillfully, sponsoring those persons you believe are capable of winning a prize in the "Words-Within-Words" contest. You may sponsor members of your family.

SPONSOR PRIZES

1st Prize	$100
2nd Prize	$ 50
3rd Prize	$ 25

In addition, there are five more prizes of $5 each!

Dear.....

I think you can win an Aeronca airplane or a Crosley sedan free!
If not one of those prizes, a camera, a set of tools, a power lathe, a radio or one of a hundred valuable items. For details see the "Words-Within-Words" contest in the magazine MECHANIX ILLUSTRATED. It's now only 10c at all newsstands.
I hope you enter. If you do, I may win $100 as your sponsor. Don't forget, put my name down on your entry blank as sponsor!
There are no catches in this contest. No slogans to think up. No essays to write. The highest score wins and I'm sponsoring you because I think you can win.

Your friend

.....

Dear.....

I think you can win an Aeronca airplane or a Crosley sedan free!
If not one of those prizes, a camera, a set of tools, a power lathe, a radio or one of a hundred valuable items. For details see the "Words-Within-Words" contest in the magazine MECHANIX ILLUSTRATED. It's now only 10c at all newsstands.
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There are no catches in this contest. No slogans to think up. No essays to write. The highest score wins and I'm sponsoring you because I think you can win.

Your friend

.....

Shoot Pictures On Bromide

[*Continued from page 100*]

second at f/4.5. The resulting paper negative was copied on another sheet of paper to produce the perfect positive print.

Portraits made on paper can be improved in other ways than pencil retouching if the original results are not satisfactory. For instance, if the background is confusing, you can eliminate it entirely and, in its place, substitute either a solid black or a white one. To do this, just cut the principal subject out of the paper negative with a pair of scissors, and use only that portion in contact printing. The result will be a solid black background. For a white background, simply glue the cut-out negative to a sheet of black paper and copy the resulting set-up on paper. You will then have a portrait with a white background.

Printed pages of books, magazine articles, and black and white line drawings are ideal subjects for direct paper negative work. These can be photographed on paper and the resulting negatives contact printed without losing any of the fine detail. Since there are no middle tones through which the paper grain of the negative can print, the positive print resulting from contact printing the negative, will be as clear and perfect as though it had been taken on film. Thus, you can, in a few minutes, copy any important information or diagrams you may need from borrowed books, etc. Figures H and J show the results of such work.

If you are planning to take a few color pictures with Kodachrome, and you don't want to waste any of your expensive color film, you can get a fairly good idea of how the composition and set-up will appear if you first shoot it on a sheet of bromide paper. You can develop this paper negative in a few minutes, and by it, determine the good and bad points of your composition and lighting arrangement, before going ahead and shooting the picture on color film.

A simple way to test the accuracy of your flash synchronizer is to shoot a picture of the flashbulb as it goes off, simultaneously with the tripping of the shutter. Since the bulb gives off such a tremendous amount of light, bromide paper is the ideal material to photograph it on. You can either set the flash up on an extension in front of the camera lens, or leave it attached to the camera and shoot its reflection in a mirror. Shoot at about 1/250 at f/16, and develop the paper negative only enough to show how much of the wire filling is burning. If all of it is burning, the synchronizer is working perfectly; if only the central portion of it is burning, the bulb is firing too late; and if the central portion is burnt out and the outside portion is burning, the bulb is firing too soon.

Other uses for bromide paper photography will crop up daily and give you new and economic pleasures with your camera.

The U. S. Forest Service has devised a machine that will plant about 8,000 trees or shrubs a day.

FOR TARGET PRACTICE
SMALL GAME & VERMIN SHOOTING
If it's
PERFORMANCE
YOU WANT IN
A .22 RIFLE
Accuracy is the foremost quality of a Savage .22 Rifle. Accuracy that's outstanding in the light rifle field. That's a matter of record—proved time and again through owners' experience, and comparative targeting tests.
Second only to this most important feature is the speed and dependability of the rifle's action. No long interval, no shift in aim between release of the striker and firing. The bolt throw is short, smooth, and easy. You can demonstrate these features to your own satisfaction by operating the rifle at your dealer's before you buy.
Finally, the man's size walnut stock is well proportioned. It enables you to hold steadily on your target and make the most of the rifle's accuracy.
Yes . . . if it's Performance you want in a .22 Rifle, you'll do best to select a Savage.
Model 3—Single Shot
Model 4—Clip Repeater
Model 5—Tubular Repeater (illus.)
SEND FOR FREE CATALOG
and current price list, on all Savage Rifles and Shotguns.
Savage Arms Corporation
Dept. 1646, Utica, N.Y.
SAVAGE
.22 Rifles

Here Are Contest Puzzles No. 1 & 2

To enable readers who were not able to purchase copies of the February or March issues of MECHANIX ILLUSTRATED at their local newsstands, due to sell-outs, to enter the contest, we are reprinting the blanks for puzzles 1 and 2 on this page.

A par, or average, score for Puzzle No. 1 is 275; for Puzzle No. 2, 280. Do your best to beat these par scores, aiming for the highest score possible!

When you have completed these two puzzles and Puzzle No. 3, appearing on page 77, cut them out and send all three completed puzzles in together, by first-class mail, to the "Words - Within - Words" Editor, MECHANIX ILLUSTRATED 1501 Broadway, New York City. Don't forget to add up your scores for the three puzzles and put the total after the space marked "Grand Total" on the coupon at the bottom of Puzzle No. 3.

In answer to readers' questions, the following will clarify some points of the contest:

Plurals are permissible if they can be formed with a letter in the Keyword.

Proper nouns (names, places) are permissible if they can be found in the dictionary.

Crosswords must not have more than eight letters.

Hyphenated words are not acceptable.

Any generally accepted form, or tense, of a verb is acceptable provided it appears in the dictionary named in the rules.

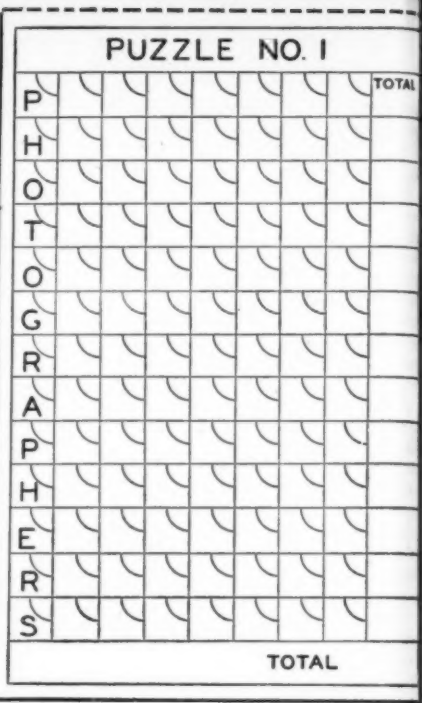
Possessives formed with an apostrophe are not acceptable.

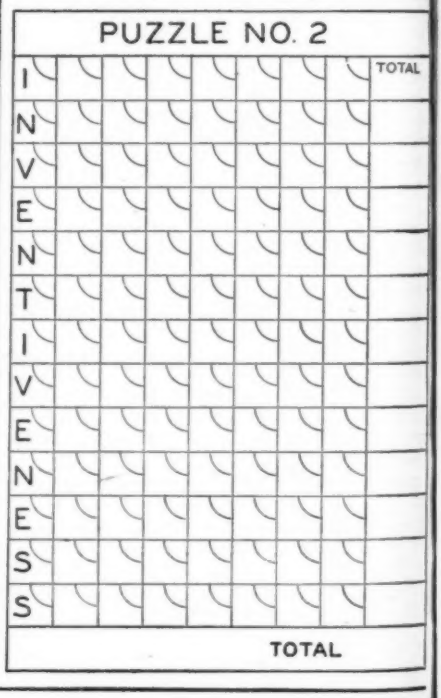
"Par" is an average, arbitrary score. You are supposed to get the highest score possible.

Canadians are eligible to enter the contest.

Above all, read the rules carefully, study the specimen puzzle, make sure to be accurate in your scoring, and get to work and win one of those swell prizes!

Names of the prize winners will be published in an early issue of MECHANIX ILLUSTRATED. Watch for them—You may be a winner!





Five Dollar Fortune

[*Continued from page 45*]

stores. They let their imaginations go wide open on the staggering sums the orders were to net them. They didn't know what they were getting into.

Mr. Kapp came back. He wanted samples. He wanted to see if he, too, could get colossal orders like that. The boys were a bit startled at the thought of the hard working laundry man trudging the streets with samples—all because of their tall story. But Louis Kapp wouldn't take no for an answer. He got his samples and a commission agreement. Then he left, taking his huge wood and cardboard display case with him. The boys went on with their shop work.

In a little while Louis Kapp returned. He'd sold all the samples. Bill Bibichkow and Sam Goldenberg stared wide-eyed as Louis peeled off the $25 he'd received for the models. Still a trifle dazed, they filled his sample case again and went back to work—in a rosy fog as they watched Louis and his sample case disappear down the street. Just as they began to get back to normal the astounding Mr. Kapp showed up again. He'd sold them all, and wanted more!

He went right on selling. He sold models and supplies so fast that he became a partner, and helped build the things at night to sell during the day. With business gaining, the three musketeers of the model industry expanded their business. They rented a little store and bought an old Ford for the moving job and for field work. But all success stories must have a tear-jerking paragraph. On the way to the new store the Ford was demolished in an accident. Then the bank closed up with all their capital. Then a fast-talking salesman persuaded them to try selling their products by mail. This flopped with a loss of $250. Things looked bad.

There seemed to be only one answer, and Louis Kapp had it. The battered and twisted wreck of the old Ford was dusted off. Once more the impossible was accomplished, and in a short time the boys took to the road in the Model T. A goldmine of orders in Milwaukee put Kapp in stride. One new territory after another blossomed under the magic touch of the super salesman. Bill and Sam could no longer produce enough models and supplies so help was employed. The factory soon covered 11,000 square feet. But that wasn't enough. Bill had a knack for designing super models, and Sam knew how to produce them.

Today their factory has 70,000 square feet of area—in which hundreds of skillful workers turn out 10,000,000 model kits a year plus hundreds of thousands of model parts and supplies. The glider that was to have been made from the back fence and the fruit boxes, however, simply didn't get built.

Prior to 1780, the American Army had no one uniform; each state, regiment, or even individual company dressed its men as it chose.

WET CELLARS MADE DRY
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WHERE water or moisture seeps in through cracks or porous spots in the cellar floor or walls, you can make and keep your cellar dry and sweet by filling the cracks and coating the moist surface with Smooth-On No. 7.

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Excellent also for patching concrete floors, waterproofing garage, stable and washroom floors, brick walls, cisterns, septic tanks, water troughs, fountains, fish ponds, swimming pools, manure pits, etc.

About 25 pounds of Smooth-On No. 7 are required for each 100 square feet of surface covered, and no experience is necessary. Complete instructions on the package.

Sold in 5-pound cans and 25, 50 and 100-pound kegs.

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filled with simple instructions and diagrams for making many household and automobile repairs—all with least effort, time and expense. Every handy man should have a copy for guidance in sealing cracks and stopping leaks of water, steam, gas, etc., tightening loose parts in metal, concrete or wood, etc.

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How Good Are Our War Machines?

[*Continued from page 49*]

prepared in the field of anti-aircraft ("AA") and anti-tank ("AT") defense. In AA guns, we possessed nothing heavier than the 3-inch models, which have been proved to be ineffective in modern warfare due to the fact that they do not reach the 20,000 to 25,000 foot ceiling at which modern bombers fly. We have since rushed production on a 90 mm. AA with a higher range, and we are now producing an even more powerful model in the form of a 4.2 inch AA gun reputed to have a ceiling in excess of 30,000 feet!

Production of this 4.2 inch AA gun will give America a definite edge in this field.

With our General Staff thoroughly alert to the increased value of the offensive in modern war, a large proportion of these AA guns are undoubtedly being equipped with mounts permitting them to attain the highest mobility and speed in getting into action for the protection of mobile ground troops.

Our Army for a time was slow in realizing the importance of fast mobile anti-tank and anti-aircraft artillery of heavy caliber. The tendency was to separate the two categories of guns instead of combining their functions in one piece as is done so frequently in the German and Russian armies. In addition we clung too stubbornly to old fashioned, gun-muzzles-to-the-rear, hauled-in-limber, artillery pieces with the consequent delay in unlimbering and getting into action, and with a further slowing up due to dependence upon old fashioned firing technique with gunners required to wait firing commands from the chiefs-of-section.

"Harley is a very poor buyer."

A limbered 75 of this type is almost worthless as anti-tank protection. It requires from eight to 14 minutes for a crew to jump out of their truck, unlimber the gun, set it up and wait for firing instructions. Anyone can imagine what would happen to a weapon of this type when it was employed against a column of tanks advancing at a speed of 30 to 45 miles per hour!

The German anti-tank guns, accompanying their Armoured Divisions and mechanized infantry columns, are mounted on self-propelled, full track caterpillar-mounts, moving at 30-45 miles an hour, with the guns facing forward, gunners behind armored shields, at the breech of the piece, ready instantly to go into action in 50 seconds without command from chiefs-of-section. When I criticized our lack of these effective weapons several months ago in an article, the Army some weeks later published pictures of some evidently rather hastily extemporized "tank destroyers." One of these was a 75 mm. gun mounted on a half-track truck of standard design, without armor protection for the crew. It is highly questionable whether such a vehicle could stand the stress and strain incident to firing the piece under combat conditions. The second so called tank destroyer was the already noted ineffective 37 mm. gun mounted on one of the "jeep" cars, its muzzle projecting over the driver's head without sufficient depression space to fire at the vulnerable enemy tank treads, and the breech projecting in rear of the car, necessitating its crew dismounting from another vehicle and serving in the open without armored protection.

In contrast to the massive German tank destroyers, carrying modern 75 mm. or 105 mm. guns, served by gunners behind shields, on a full track caterpillar tread vehicle, moving at high speed and ready instantly to go into action, our tank destroyers so far shown, would seem to lack effectiveness to a dangerous degree.

German Panzer division artillery is self propelled with gun muzzles faced to the front, and gunners, protected by armored shields, ready for instant action at the breech of their guns. Today we are increasing the caliber of our anti-tank artillery, placing it on self propelled mounts and forming units of fast tank destroyers which undoubtedly will give a good account of themselves in battle.

With our lighter caliber cannon supplemented by excellent Swiss and Swedish model guns, now in heavy production and our modernized World War I 75 mm. guns being rapidly replaced by 105 mm. howitzers, our Army is slated to have fire power and battering ability equal to any in the world.

About 85% of the world's radium is used for medical purposes.

CCC Of The Seas

[*Continued from page 52*]

been established: two on the Pacific coast, at Alameda and Hueneme, Calif.; one at St. Petersburg, Fla.; and three on the North Atlantic coast, at Gallups Island, near Boston, at Hoffman Island near New York, and at New London, Conn. The last is the location of the Coast Guard Institute and therefore headquarters of the Maritime Service administration.

After three months at one of these training centers, the enrollee goes on one of the service's five training ships, specially maintained for instruction of apprentice seamen. Two are 3-masted auxiliary sailing vessels: the *Joseph Conrad*, attached to the St. Petersburg training station, and the *Vema*, at Hoffman Island. On these, enrollees get a chance few modern youths obtain, no matter how much they yearn to go to sea—the opportunity of working under sail in the manner of America's pioneering seamen.

Appreciating the wide variation in abilities and requirements among men enrolling, training courses were developed with a view to providing each with a course suited to his individual needs and ability. Instruction methods and texts used are those of the International Correspondence Schools at Scranton, Pa.

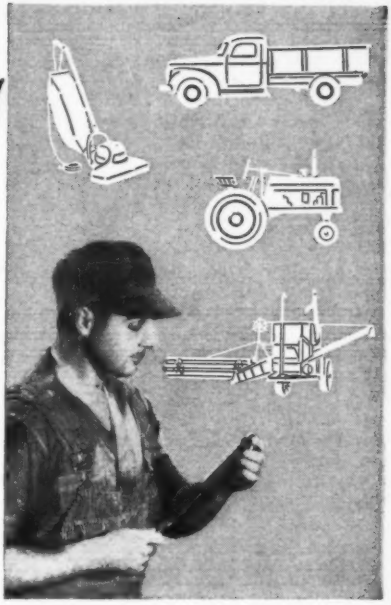
Upon satisfactory completion of the training course, enrollees are given transportation to jobs on merchant vessels. Though no job is guaranteed at enrollment, up to the present there have been more jobs than applicants, a situation which can be expected to continue because of the wartime demands on the Merchant Marine both on inland and sea trade routes.

In his job on a ship the recent trainee has a number of I. C. S. courses made available to him at no cost, so that he may continue to increase his general and professional knowledge. Among the courses offered are ocean and motorboat navigation, gas and electric welding, marine steam and electrical engineering, Diesel and internal-combustion engines, mechanical drawing and blueprint drawing, grade and high school subjects, English, algebra, communications, and so on. These correspondence courses are administered, like the shore and ship training period, by the Coast Guard Institute, and the U. S. Navy sees that lesson-mail is delivered to the seamen regularly no matter where they are stationed or on what vessel they are working.

It's evident from these arrangements that the Maritime Service's aim is to have its enrollees leave the sea more highly skilled workmen and better-educated men generally. Knowledge is not forced upon them, but they see on every hand evidence that advancement and more pay go to the men mentally prepared for them.

Young men who enroll in the Maritime Service within the next few months will have the proud honor of helping it expand rapidly without in the least diminishing the quality of the training given,

[*Continued on page* 160]



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NICHOLSON FILES FOR EVERY PURPOSE

NICHOLSON U.S.A. MADE IN U.S.A.

This Is The Sub's Last War!

[*Continued from page* 38]

submarine fleet had been sunk. A third big factor which may still further increase the number of U-boats that "just don't come back" is now said to be close to realization. This is an American device by which it will be possible to detect the presence of submarines on the surface at night.

No details have been released, of course, but it is understood that the new detector can spot a U-boat at a considerable distance during the blackest night on the North Atlantic. This is a major advance because submarines at sea can spend only a few hours of each day beneath the surface. They must come up during most of each night to recharge their batteries and take on fresh air. Moreover, they make many of their most damaging attacks on convoys at night, moving swiftly on the surface and firing with their deck armament.

Still another effective counter-submarine development has been the Canadian-built corvette, a lightly armed but nimble little vessel that does the work of a destroyer on convoy duty. Scores of corvettes have been built in Canada since the war's start and have given a good account of themselves at sea. Some are known to have bagged two or more U-boats apiece.

Against all these improvements in the technique of anti-submarine action there has been no word whatever of any real advance in the design or performance of the submarine itself. About the only new development has been the midget U-boat with its 12-men crew which Germany is now said to be building in considerable numbers. However, this boat carries only two torpedoes and is decidedly limited in its range of action. It may prove useful in the English Channel but not in the open sea.

One important improvement in tactics has been noted recently, however. Where formerly submarines usually traveled alone, they now tend to hunt in "wolf packs" of six, twelve, or even 15 undersea vessels, trailing a convoy and attacking it and retreating alternately in battles with the escort vessels that sometimes last two or three days. Occasionally the entire "wolf pack" will come to the surface in the very center of the convoy at night, loose a volley of fire in all directions, and dive for cover. Still another method is that of the "tangential attack" in which a line of submarines will launch torpedoes simultaneously at one flank of a convoy and then turn tail and run, hoping that the escort vessels on that side have been put out of action.

Yet neither of these maneuvers involves any marked betterment in the construction or equipment of the submarine itself—except, possibly, some device that makes it possible for it to communicate more easily with its kind. Indeed, there is some evidence that the new strategy was virtually forced on the Germans not so much by its efficacy as by the fact that lone submarines are

[*Continued on page* 158]

Model Q-Ship, Sea Raider

[*Continued from page* 120]

with 1/32"x1/16" pine strips. A short ladder goes at the back of the aft bridge. This and the other ten ladders should be purchased, as well as the wheel and engine room controls; or you can make them if you have the time and patience. The ladders and above fittings may be put in their places now, or later, as you wish.

Now carve the torpedo tubes out of a length of 3/16" or 1/4" dowel. There are two, one on each side. Paint them brass (gold) and put them in positions shown. The plan will tell you where and how the false cabin sides, pieces of smooth cardboard, are fastened with a length of Scotch tape or adhesive to the floor of "A" deck. There should be just enough room for the sides to raise and lower without touching the uprights.

The guns are carved out of dowel, just as the torpedo tubes were, and mounted fore and aft. The false houses covering them are made up of 1/16" pine or cardboard. Do not add a bottom to them, for they must be able to lift off. They should be glued together well, and fit snugly over the gun platform. Allow about 1/8" clearance around the guns. The guns as well as the torpedo tubes may be purchased. Fasten them to the deck by drilling a hole through them and running a pin through it into the deck.

There are eight main cargo hatches. They go on the well decks. Make them of cardboard, taking size from deck plan. Glue them in place on the deck.

Between them, fore and aft, go the cargo winches and mast houses. Their construction will be found in the plans. A word about the winches: make certain that the drums, 1/4" cardboard disks, clear the deck by at least 1/16" and that they are glued together strongly enough to be able to take the tension from the thread that leads to them from the masts and booms.

The mast houses are solid pine with holes drilled in them for the masts. There is no rake to the masts. Glue and nail the houses to the deck. They are capped with cardboard, allowed to overhang about 1/8".

The booms, which are the last thing to be put on, are put in place either by drilling small holes in the mast house or by pegging them in with pins in the following way: Clip off the heads of the pins and drill holes in the ends of the eight booms, about 1/8" deep. Insert flat end of pin into hole with a bit of glue. At the proper place drill four holes in the top of the mast house and insert the pins, using a bit of glue to prevent the booms from turning around. The top part of the masts are fastened to the lower in exactly the same manner. Notice that only the fore mast has a crow's nest, and that there are cardboard crosstrees just where the two sections join. Make the masts and booms now and put them away until everything else is finished.

[*Continued on page* 158]

Editor's Workbench Chips

[*Continued from page 22*]

the emergency brake. Maybe you can figure it out!

"Nut busters": Truck mechanics.

"Pop-cart": A motorcycle, naturally.

"Yodeler": A noisy set of gears.

"Freeholing": Coasting while the truck is in neutral.

"Cackle crate": A jeep—it's full of rattles.

"Lazyback": The truck driver, of course.

What the boys call a breakdown, we are not permitted to print.

Shop fans will be interested in this workbench built by seventeen-year-old Donald Burtard, of 1006 16th St., Two Rivers, Wis. It's made of solid birch, and is 30 inches high, 20 inches wide, and 54 inches long. That tool rack at the back undoubtedly saves Mr. Burtard a lot of time—that many shop fans spend searching for misplaced bits and chisels. The workbench contained in HANDY MAN'S HOME MANUAL No. 6 also includes ample tool space. For those readers planning to build a workbench, copies of the book are available at 50 cents from Fawcett Publications, Inc., Greenwich, Conn. Complete detailed plans and instructions are included in the article on the workbench construction. It's an economical design, too. A $3.00 Workbench Award and a Certificate of Medit go to Mr. Burtard.

This machine is an electric hedge cutter built by Mr. W. E. Dow, of 711 Sumner Ave., Springfield, Mass. Mr. Dow says it is the result of being too lazy to cut a hedge by hand. The machine is under power only about 10 per cent of the time it's in operation, as the momentum of the revolving cutter blade is sufficient to do the job the rest of the time. The motor is one rescued from an old vacuum cleaner. The top and bottom of the machine are made of aluminum plate, and the cutting blade of steel. As the machine has been in trouble-free operation for two years, it probably was an easy matter to get the aluminum at the time it was made. The total cost of the job, not including the 65-foot extension cord, was exactly $3.00.

Mr. Dow receives a $3.00 Workbench award and a Certificate of Merit for this snapshot.

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This Is The Sub's Last War!

[*Continued from page* 156]

no longer effective. Observers of naval affairs point out also that a "wolf pack" represents a terrific gamble for the Nazis because it means putting so many expensive eggs in one basket. If detected in time, a dozen submarines, costing above $5,000,000 apiece may be lost along with their precious crews of trained men.

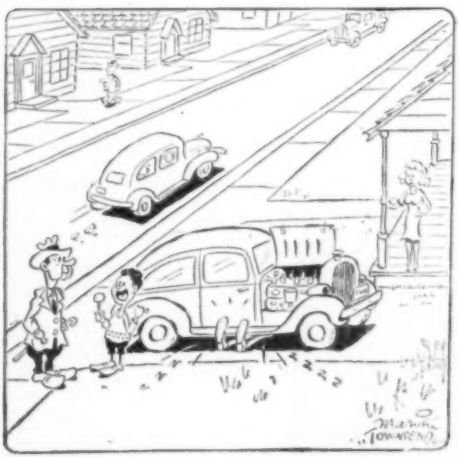
Another ominous note on the submarine's future was also sounded recently by a British Admiralty disclosure announcing the current internment of 1,276 officers and men from Axis U-boats, against a total of only 400 such prisoners held last April. This indicates that the number of such captures has more than doubled in six months. From this it may be logically inferred that the number of submarine sinkings has likewise been accelerated. *The total of submarine prisoners, by the way, is already greater than the total of those captured during the entire World War!*

Our shipyards now turn out ships faster than the Axis can sink them, which is a rather negative but convincing way of saying that the U-boat's stranglehold on the British Empire's life-line is growing visibly weaker.

Discounting all other evidence, the case for the contention that the submarine is on its way out can well rest on one simple development which, in the morning papers of a few weeks ago, required but three paragraphs in the telling. *This was the announcement that war risk insurance rates on cargoes between the Americas and Britain had been reduced by 25%.*

In the period between 1875 and the World War the real development of the modern submarine took place. Two American scientists, John P. Holland of Paterson, New Jersey, and Simon

[*Continued on page* 159]



"Pa tells Ma he's fixing the car so he can sleep on Sunday afternoon, instead of taking us for a drive."

Model Q-Ship, Sea Raider

[*Continued from page* 156]

There are 21 vents. Carve them to the sizes given or purchase them, as you wish. Put them in position now according to plan. Make certain that they are glued securely, and won't turn. Also, notice that there are two hammer-like vents made up from 1/8" dowel. They are cemented in place at each side of deck house at the rear of the funnel.

The stack is made of wood dowel of the correct diameter, or bent from a piece of metal and soldered together. Smooth cardboard glued carefully together, and fastened with glue and nails to a flat pine piece, 1/16" thick 2¾"x1½", may also be used. Place a skylight at the rear of this piece and two lengths of 1/8" dowel in front and back of the stack, to act as whistle and steam pipe. Add the two vents and glue the whole affair in place on the deck.

Right behind this is the aft deck house. Make it from a pine block 7/16"x1½"x1¾". It is capped with a smaller piece of cardboard. Glue and nail it in place between the two hammer-like vents. All this superstructure is gray, the same as the hull, only the insides of the vents being bright red.

While you are working on this deck you may as well put the davits and life boats on. The davits are made of 1/16" piano wire cut off and bent to shape. Put them in holes drilled in the deck and glue them so they stay in place. Make sure they don't stick out and show below the deck. If you can obtain the correct sizes, purchase them, together with the six boats. The latter are hard to carve out and can be bought very reasonably. There are two sizes and two kinds. Double and single end boats. The small ones are 1⅝" long, the large, 2⅛" long. The davits that go alongside the cabin are also made of the same size wire but the ends are bent, forced into the hull sides, and glued. Make the boat cradles and hoists out of bits of cardboard. Cradles are not needed for the large boats, which are simply glued to the side of the deck, as shown on the plan. However two cardboard hoists should be placed on the deck.

A winch goes on the forward deck, just in front of the gun house, and around it, inserted in holes made in the deck, is the anchor chain. This chain, together with the stockless anchors and hawse lips, should all be purchased. The chain goes on only *after* the holes are drilled and the hawse lips glued over them.

Make all the flat (small) hatches of smooth cardboard cut to the size on the drawing and glued to the deck and cabin.

The bitts are made of pin heads inserted into holes drilled through 3/8"x1/8" bits of cardboard, and then into the deck. The four life rings should be purchased if you cannot obtain a 3/16" diameter ring. They go alongside the cabin rails and on the front of the aft bridge. The search-

[*Continued on page* 160]

Flag Initials For Your Car

[*Continued from page* 101]

Cement the flag strip to the car door with an adhesive such as weather-strip cement or white shellac. The cement is a preparation that will not damage the car finish. Do not use pyroxylin household cement or "liquid solder." The solvent in it may attack the door finish. For fastening the initials to glass, any clear cement such as Canada balsam or pyroxylin cement will do.

Flag initials can be made in any size for decorating jewelry boxes, paneled doors, and other craft work. They can be done in colored porcelain by hobbyists who follow that art, or they can be assembled like jig-saw puzzles from bits of colored plastic or wood for use on book ends, wooden photo-album covers, and dozens of other objects. —*Walter E. Burton.*

This Is The Sub's Last War!

[*Continued from page* 158]

Lake of Connecticut, led the way although the money supplied by European governments, notably Russia, Turkey, France, and Germany, did far more to further their experiments than any contribution by their countrymen or our own American Government.

A common drawback of the late Nineteenth Century submarine was its erratic behavior when submerged. This was caused by the use of rudders designed to turn the craft downward under water. Holland clung to the "diving" type, using horizontal rudders at the stern only, while Lake is credited with "even keel" submersion, employing hydroplanes at both the stern and the bow. Plus this, he perfected the ballast method of submersion and emerged as the holder of more basic patents in modern submarine construction than any other inventor.

Mr. Lake, still hale and hearty as this is written, is naturally all-out in his confidence in the submarine's formidability. Shortly before the outbreak of the current war, he predicted that the U-boat would prove to be an all-decisive factor in any new world conflict. He likewise prophesied that the only answer to the submarine menace would be the construction of submersible cargo vessels. He went to Washington not long ago to offer this idea to the Government but met with little response.

The mere fact that the shipping crisis has at no time seemed to warrant such a daring departure is perhaps another argument against the final effectiveness of the submarine although Mr. Lake, so long convinced of his invention's primary importance, might be loath to agree. At any rate, he gets a vote of thanks for proposing a device designed to thwart his own brain child. But more effective weapons have already indicated that the sub is now in its death throes as a war power.

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This Is The Sub's Last War!

[*Continued from page* 156]

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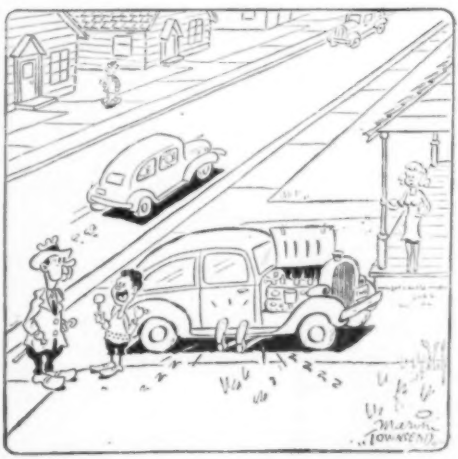
[*Continued on page* 159]



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Model Q-Ship, Sea Raider

[*Continued from page* 156]

There are 21 vents. Carve them to the sizes given or purchase them, as you wish. Put them in position now according to plan. Make certain that they are glued securely, and won't turn. Also, notice that there are two hammer-like vents made up from 1/8" dowel. They are cemented in place at each side of deck house at the rear of the funnel.

The stack is made of wood dowel of the correct diameter, or bent from a piece of metal and soldered together. Smooth cardboard glued carefully together, and fastened with glue and nails to a flat pine piece, 1/16" thick 2¾"x1½", may also be used. Place a skylight at the rear of this piece and two lengths of 1/8" dowel in front and back of the stack, to act as whistle and steam pipe. Add the two vents and glue the whole affair in place on the deck.

Right behind this is the aft deck house. Make it from a pine block 7/16"x1½"x1¾". It is capped with a smaller piece of cardboard. Glue and nail it in place between the two hammer-like vents. All this superstructure is gray, the same as the hull, only the insides of the vents being bright red.

While you are working on this deck you may as well put the davits and life boats on. The davits are made of 1/16" piano wire cut off and bent to shape. Put them in holes drilled in the deck and glue them so they stay in place. Make sure they don't stick out and show below the deck. If you can obtain the correct sizes, purchase them, together with the six boats. The latter are hard to carve out and can be bought very reasonably. There are two sizes and two kinds. Double and single end boats. The small ones are 1⅝" long, the large, 2⅛" long. The davits that go alongside the cabin are also made of the same size wire but the ends are bent, forced into the hull sides, and glued. Make the boat cradles and hoists out of bits of cardboard. Cradles are not needed for the large boats, which are simply glued to the side of the deck, as shown on the plan. However two cardboard hoists should be placed on the deck.

A winch goes on the forward deck, just in front of the gun house, and around it, inserted in holes made in the deck, is the anchor chain. This chain, together with the stockless anchors and hawse lips, should all be purchased. The chain goes on only *after* the holes are drilled and the hawse lips glued over them.

Make all the flat (small) hatches of smooth cardboard cut to the size on the drawing and glued to the deck and cabin.

The bitts are made of pin heads inserted into holes drilled through 3/8"x1/8" bits of cardboard, and then into the deck. The four life rings should be purchased if you cannot obtain a 3/16" diameter ring. They go alongside the cabin rails and on the front of the aft bridge. The search-

[*Continued on page* 160]

Flag Initials For Your Car

[*Continued from page* 101]

Cement the flag strip to the car door with an adhesive such as weather-strip cement or white shellac. The cement is a preparation that will not damage the car finish. Do not use pyroxylin household cement or "liquid solder." The solvent in it may attack the door finish. For fastening the initials to glass, any clear cement such as Canada balsam or pyroxylin cement will do.

Flag initials can be made in any size for decorating jewelry boxes, paneled doors, and other craft work. They can be done in colored porcelain by hobbyists who follow that art, or they can be assembled like jig-saw puzzles from bits of colored plastic or wood for use on book ends, wooden photo-album covers, and dozens of other objects. —*Walter E. Burton.*

This Is The Sub's Last War!

[*Continued from page* 158]

Lake of Connecticut, led the way although the money supplied by European governments, notably Russia, Turkey, France, and Germany, did far more to further their experiments than any contribution by their countrymen or our own American Government.

A common drawback of the late Nineteenth Century submarine was its erratic behavior when submerged. This was caused by the use of rudders designed to turn the craft downward under water. Holland clung to the "diving" type, using horizontal rudders at the stern only, while Lake is credited with "even keel" submersion, employing hydroplanes at both the stern and the bow. Plus this, he perfected the ballast method of submersion and emerged as the holder of more basic patents in modern submarine construction than any other inventor.

Mr. Lake, still hale and hearty as this is written, is naturally all-out in his confidence in the submarine's formidability. Shortly before the outbreak of the current war, he predicted that the U-boat would prove to be an all-decisive factor in any new world conflict. He likewise prophesied that the only answer to the submarine menace would be the construction of submersible cargo vessels. He went to Washington not long ago to offer this idea to the Government but met with little response.

The mere fact that the shipping crisis has at no time seemed to warrant such a daring departure is perhaps another argument against the final effectiveness of the submarine although Mr. Lake, so long convinced of his invention's primary importance, might be loath to agree. At any rate, he gets a vote of thanks for proposing a device designed to thwart his own brain child. But more effective weapons have already indicated that the sub is now in its death throes as a war power.

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CCC Of The Seas

[*Continued from page* 155]

to meet the call for Merchant Marine personnel in strengthening and increasing the "bridge of ships." An idea of the situation can be gained from a few figures. Since the first training center was opened in 1938, but 3,671 men had by last October taken the training that would ultimately fit them for ship jobs paying $72.50 a month with food and quarters furnished. The new schedule, to keep pace with ship launchings, calls for 16,000 men to complete the course *each year* for the next three years at least.

Stepping up the enrollment that tremendous percentage doesn't mean that just any youth will be accepted, however. After all, ship duty at any time, but especially now, is only for husky, intelligent youths who're not likely to fall sick and who'll do their part in keeping the crew a smooth-functioning organization. First along, only one applicant in ten was accepted; recently, the proportion was one in three—still a pretty high proportion of elimination considering that the ages 18 to 23 are considered a man's healthiest. According to Maritime Service officials, requirements as to physical condition have been relaxed somewhat only in the case of youths desiring to be trained for work as ship's cooks and bakers.

The advantages of the Service's training are also available to licensed and unlicensed seamen already a part of the Merchant Marine. They must be American citizens over 19 years of age and must have served at least 12 months within three years immediately prior to application, on merchant vessels of the U. S. of 500 gross tons or more operating on the Great Lakes or any ocean. Licensed personnel who have served as officers in charge of a watch are eligible for enrollment as ensigns at $125 per month. Unlicensed men of the deck, engineer's, steward's, and miscellaneous departments are eligible for enrollment at $36 a month. Opportunities for radio-minded youths are outstanding in particular in Maritime Service training now.

"Nyeh-h! You can also plug it in and shave with it!"

Model Q-Ship, Sea Raider

[*Continued from page* 158]

light may also be bought or made from a short length of 1/8" dowel, and fastened to the top of the cabin with wire bent to form brackets. The running lights are short lengths of cardboard cut to shape, with a bead glued to the corner to represent the light.

Eyelets should be used for fastening the stays of the stack and for holding the lines of the booms. All other detail can be taken from the plans and photos, as well as any you may have of this type of ship. Just take your time and work carefully. Above all don't get discouraged when making the fittings, and you can always buy what you cannot make.

Full sized blueprints of the Q-ship are available for $2.00 postpaid. Address Fawcett Publications, Inc., Greenwich, Conn., enclosing check or money order. Order by number, 334.

Garden For Cut Flowers

[*Continued from page* 124]

as shown. Solder up the metal water tank. From the storm screen cut two pieces of the wire to make a not-too-snug fit in the tank, then solder the copper or brass legs in place to bring the top screen piece level with the top of the tank. Brad and glue the fence panels together, paint tank and holder with white enamel. Paint fence and bottom inside and out, with white or near-white. If you are handy with brush and oils you can paint in grass along the lower edges of the fence, also put a climbing, flowering plant or two at each corner.

Wheelbarrow Holder

An accompanying layout shows the dimensions and shapes of the pieces needed for the wheelbarrow holder. You'll need two side pieces and one of each of the others. Brad and glue the parts together, then make the tank to fit. Cut a piece of the storm screen to make a loose fit in the bottom of the tank, then bend each corner sharply down to provide feet and hold it off the bottom to catch the lower tips of the stems. The upper piece of screen is soldered into the top of the tank. The wheel is held in place by a single long brad driven through the prongs of the bottom piece. Be sure this wheel turns easily.

Paint white over all, then, if you choose, decorate with brush and paints as indicated.—*Dale Van Horn.*

A way of "milking" American skunks and muskrats has been found at a New York laboratory, to provide the perfume industry with fixatives or blending substances replacing imported musk, civet, ambergris, and castoreum.

The "PR" Receiver

[*Continued from page* 130]

The speaker baffle shown in the photograph is 5 ply ½" plywood. If you would really like to get fine tone out of your speaker, mount it onto a very large baffle—let's say, about two feet square. Cut a hole in the baffle slightly smaller than the speaker and either four or eight holes around the outside of the cut out for mounting purposes.

The output transformer used with the speaker is of the universal type. These transformers have three primary leads and six taps on the secondary for connection to the voice coil of the speaker. Only the two outside leads on the primary are used. In the case of this transformer these leads are colored black. The extra lead is either clipped off or can be curled up, but it is not used. Directions are supplied with all universal transformers for properly matching the voice coil of the speaker to the tubes being used. In the case of this transformer, the use of tap No. 1 and tap No. 6 gave the best impedence match to the 25L6GT tube. Short connections are made from these two taps to the voice coil terminals of the speaker. The two black leads of the transformer are then connected to the Fahnestock clips on the baseboard of the receiver.

The set is tuned in the same manner as explained last month, with the exception of the added convenience of the volume control. Those of you who have built last month's receiver have noticed that as the regeneration condenser is advanced to the point where the set oscillates, the volume increases and the receiver tunes sharper. If it were not for the volume control, the regeneration condenser would have to be turned down to maintain normal room volume. This, however, would decrease the selectivity of the receiver and reduce its ability to separate stations on the tuning condenser. With the volume control, now, you can maintain the regeneration control condenser right up to the critical point and keep the volume from being too great by turning down the newly added volume control. Maintaining the regeneration control at the critical point of operation makes the receiver extremely selective.

Four-Leg Drop Leaf Table

[*Continued from page* 128]

Pivots on upper and lower arms are similar except that the upper king-bolt screws into a plate recessed into the table top, while the lower bolt is fitted with a thin nut on the bottom. Note that the legs are attached to the arms at an angle so that when in the closed position, sides of the legs will be square with the table top. Mahogany, walnut or oak with a dark stain are suitable for this project, which should have a wax finish.—*Hi Sibley*

To prevent snow glare on Canada's snow-covered aviation landing fields, corrugated pipe equipment is rolled over the snow to form ripples.

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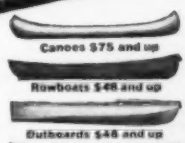

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Kilowatts Run Wild

[*Continued from page* 39]

circuit-breaker cuts out a short-circuited section, allowing the remainder of the system to function normally.

In another demonstration, a compressed-air circuit-breaker blew out a 1,500,000-kilowatt arc in a hundredth of a second.

In a room-sized refrigerator, where temperatures 20 degrees below zero can be maintained, an outdoor power switch, encrusted with frost and dangling with icicles, was tested. At 120,000 volts the current flashed over the four-foot-high porcelain insulators with a blinding light and a thundering crash.

Experiments like this indicate how much insulation a winter-proof switch must have.

The power for the 2,000,000 kilowatt flash was built up gradually by two 500-ton generators and then released suddenly in a maximum time of five seconds. This power, which is equivalent to 2,680,000 horsepower, if it could be delivered continuously, would light enough fluorescent lamps to girdle the earth twice at the equator. The sudden release of this energy caused the generators to recoil like guns. Special spring mountings took up the shock to prevent injury to the foundations.

A new safety idea is to mark highway center lines by neon tubing covered by transparent plastic, visible at night.

"Third floor, lingerie, dresses, nightgowns, slips, everything for the debutante!"

Nail Keg Furniture

[*Continued from page* 123]

pleated valance. Something in contrast to the painted surface will make a nice effect. Several such stools tucked away in the play-room corner will prove invaluable for entertaining.

In Fig. 2 we have something more elaborate. It is a chair made by first finishing off the keg as desired. Then, from heavy plywood, saw out a circular seat about 4" larger in diameter than the end of the keg. At the rear it should be extended out in a rectangular tab as indicated. A piece of fairly heavy strap iron is fashioned U shape and bolted or screwed to each side of this piece so a slot somewhat wider than the thickness of a keg stave is left between it and the wood.

Fasten three or four eyebolts around the keg near the top and as many screen-door hooks under the edge of the seat so the latter can be hooked down solidly.

The back is fashioned from two keg staves and two cleats. This slips into the slot mentioned above and rests on a block fastened to the back of the keg.

Waste baskets are always useful and one made from a nail keg is shown in Fig. 3. Saw out four triangular feet of soft wood and fasten securely to four sides of the keg at the bottom. Then at opposite sides, above the center, attach two hollow metal drawer pulls for handles. A decoration, either hand painted or a decal transfer, can be placed on the side.

Fig. 4 illustrates a simple way of building a wood basket from half a keg, split lengthways. Extra half hoops may be needed inside and out for additional strength. Then cross two pieces of full-sized barrel hoops for handles, nailing them to the keg half ends. Bind the center with cord and fashion two cradles of wood for the basket to rest in. This looks nice by the fireplace and will find many other uses, such as holding sewing materials or magazines.

The smoker will welcome the smoking stand shown in Fig. 5. Here everything is provided for. Choose a nice-looking keg and finish it off as desired. The top head is used for the holding of cigar and cigarette receptacles, ash trays and match holders. Saw out a bracket at a curve to suit the curve of the keg and fasten the ends to the keg, as shown. The space between bracket and keg should be wide enough to permit pipe stems to be thrust down between. Close to the bottom saw out and cleat a suitable sized door. Hinge it in position with catch and knob. Thus a large surplus of tobacco, etc., can be stored inside for future use. Saw out three legs of the approximate shape indicated and fasten about the bottom of the keg so the whole affair stands about 30" off the floor.

Footstools or hassocks (Fig. 6) are always welcome and by splitting another keg lengthways, two of them can be quickly manufactured. Paint them a suitable color. Then have a cushion made

[*Continued on page* 164]

Shortages Needn't Worry Workshoppers

[*Continued from page* 61]

question, a certain amount of misunderstanding exists. Illustrative of this is the case of the housewives in a certain Long Island community who were urged to save tin cans because the nation needed tin. They had a veritable mountain of cans assembled in a very short time. And then it was explained to them that a mistake had been made. The cans had no salvage value nor any other value. "Tin cans" is a misnomer. The can is not made of tin. It is made of light sheet steel, covered with a microscopically thin plating of tin. But, you may ask, has the steel no salvage value? The answer is "No." Were a carload of cans to be dumped into an open hearth furnace of the type used to melt scrap steel, the terrific heat would promptly convert the cans into vapor. And so far, no practical or inexpensive way of reclaiming either steel or tin from tin cans has been developed, except on too small a scale to be of any real value. Reports are frequent of miraculous reclaiming processes having been invented, but up to now nothing feasible has appeared.

The manufacture of new cans has already been curtailed and a shortage of cans is being felt by food packers who unquestionably will be forced to put more and more of their products into glass containers. But as regards *old* "tin" cans, the craftsman who needs a few square inches of sheet metal need feel no compunction whatsoever in cutting up cans, flattening them out and using them.

The same situation holds good with many other kinds of scrap material. Have you ever given thought to the wealth of good, usable material that a handy man can reclaim from an old, worn out, and otherwise useless piano? The type of old piano (upright) here referred to can usually be picked up for a song. In fact, it is a not infrequent occurrence for the owner of a worthless old piano to pay somebody to cart it away. But while time may have destroyed its tonal qualities and reduced it from a proud musical instrument to an old rattlebox, the solid material of which it was originally built is as good as ever. The classified advertisement section of almost any newspaper, or simply inquiry among one's friends and acquaintances is almost sure to lead the craftsman to such a piano.

There are two ways to make use of such an old piano. One is to partially disassemble it and remove the keys, piano action, pedal mechanism, strings, pins, plate, sounding board, and other inside gear and store them for possible future use, while the remaining bulk of the instrument can be modified to make a work bench, a home bar, a desk, a table or other piece of furniture wherein strength and solidity are desirable qualities.

The second way is to dismember it entirely so

[*Continued on page* 165]

During the present emergency very few new Sea-Horse outboard motors will be available. Johnson facilities today are largely given over to defense production. But call upon your Johnson Dealer nevertheless. He is in touch with the situation. If anyone can help you get a motor, new or used—or assist you with service—he can. Look for his name under "Outboard Motors" in your classified telephone book.

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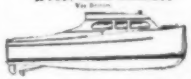

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Powder Puff Metals

[*Continued from page 53*]

Powder metallurgy is an entirely new approach to the science of using metals. It by-passes all the standard practices of first "cooking" iron ore to obtain crude iron, then treating it in various manners—by heat, the addition of chemicals, etc. —in order to obtain steel of the desired quality; then milling, grinding, machining, etc., in order to make a gear.

In this new process, metal is extracted directly from the ore by chemical means or by electrolysis. It is obtained in the form of extremely fine powder —almost as fine as talcum powder.

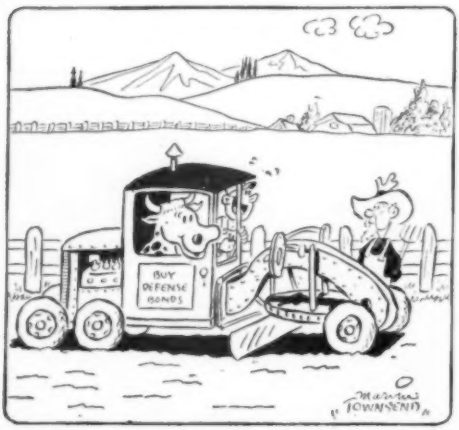
The powder is put into a hydraulic press and squeezed into any desired shape, much in the manner that briquettes are made. Gears or gadgets of almost any size or form may be pressed this way, in dies, and their diameters held to extremely close tolerances.

The outstanding advantage of powder metallurgy is the development of a technique which enables engineers to produce bearings and gears which are impregnated with oil and grease. The powder is mixed with oil before it is pressed into the form of a bearing or a gear. In effect, the gears and bearings are, in this way, given "built in" oil systems, the oil oozing out of them as it is needed.

Such bearings and gears have demonstrated themselves capable of outliving the average life of automobiles. Because of their endurance, they are effecting a great conservation of strategic metals.

But powder metallurgy has other advantages, too. It saves time, materials and manpower ordinarily used in overhauling and maintaining machines. Powder metal parts are keeping machines running far beyond limits considered normal five years ago.

More and more, the process is being used to make metal products formerly made by dies.



"She likes to ride and I like milk—so we made a deal!"

Nail Keg Furniture

[*Continued from page 162*]

for the top portion and tack it in place. Turn the keg over and fasten a triangular block in each corner to which is attached a rubber chair foot or silent dome. This prevents the stool from scratching a nicely polished floor when slid along. Castors can be substituted if desired.

In Fig. 7 you will get an idea how a keg can be utilized as a pedestal for a nice tea or coffee table. To reverse the process make the feet first. These can be made from 1⅛"x3" clear wood, mortised in the centers and crossed at right angles, edges coming flush. Set the keg chosen in the center of the cross and fasten in position. On top of the keg mount a small wooden cart-wheel, concentric with the edge. Three or four little iron straps around the spokes and attached to the side of the keg can be used.

The top consists of a piece of ½" plywood cut in a disk 36" in diameter. Carefully finish off the edges and sand the top down smooth with 00 sandpaper. Then fasten this down evenly to the wheel support with similar iron straps clamped to the spokes.

When all assembled, give the whole piece a final sanding and finish off with clear shellac or transparant varnish on the table top and enamel on the lower structure.

In Fig. 8 we have something that will attract the bride-to-be. It is a treasure chest for her most valued possessions. Pick out the best looking keg you can find and split it lengthways, making a careful cut with a fine-saw. Sandpaper to a smooth finish. Do the same thing inside or line it with some attractive material. Hinge the halves together at one end with antique hinges and, at the other end of the top section, fasten a suitable handle. Make two cradles of nice wood similar in shape and size to those fitted to the wood basket, and fasten securely to the keg. Two folding metal brackets should then be attached to the inside of the chest so the top can be lifted up and held in place.

Many other uses for nail kegs will probably come to the builder of some of these ideas. So don't throw kegs away; store them for future use and you will find many interesting ways to employ them.—*L. B. Robbins.*

"Quilted-Top" Mending Box

[*Continued from page 126*]

fully sand the patterned top to round out the quilted effect. At each point where grooves criss-cross bore a shallow hole, using a 3/16" bit. Cut small plugs from 3/16" dowels and glue one in each hole, allowing it to protrude slightly. Sand these projecting knobs to slightly rounding shape. Finish the top with several coats of shellac, rubbing well between coats. The bottom is made in a similar manner.

Shortages Needn't Worry Workshoppers

[*Continued from page* 163]

that all of its parts can be made available for use in one or a number of projects. The most efficient way is to start at the top. Lift the lid and draw the pins from the hinge or unscrew the hinges. The top lid is a nice plank. The drop shelf that holds the music and the frame that supports it come next. Finding and taking out the screws that hold these parts is not difficult.

Next comes the "fall board" as the lid covering the keys is called, and then the key slip, which is a nice straight piece of wood. Below the keyboard and extending down to the pedals is a large panel called the "bottom frame" which is held in place by springs.

The "piano action" can now be removed. This is in 88 sections, each section composed of a number of small wooden pieces and its salvage value depends on the use the resourceful craftsman can put it to.

The keys come next. The white keys are of pine or basswood with thin ivory or celluloid plates glued on. These can be removed by the application of moderate heat to loosen the glue, but this must be done carefully so that the ivory will not be scorched. The thin plates can be pried off with a knife blade and can be cut into narrow strips and used in decorative inlay work.

The black keys are of ebony in very old pianos or of walnut boiled in black stain if the piano is less than thirty years old.

The pedal mechanism and connecting rods are hardwood dowel sticks and are readily removable.

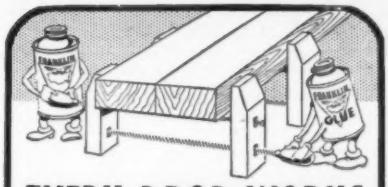
The "keybottom" can be removed after the keys are out. This is a good, straight, serviceable board about 1½" to 2" thick.

The "plate" is now exposed. This is an iron casting so heavy that a man has all he can do to lift it. Before it can be unscrewed and lifted out, the strings must be removed. Use a wire cutter and a pliers. The total aggregate tension of all the strings is approximately sixteen tons! Grasp a string firmly with the pliers before cutting it to prevent it from snapping and lashing when the cut releases the tension.

Next remove the steel pins around which the strings were twisted. There are 240 of them, and removing them is not a job that can be done in a hurry for each pin extends through the iron plate and into the wood behind it. The pins go into the wood on a slow thread and the best tool for their removal is a brace. After the pins are all out, remove the screws that anchor the plate and lift it out. This is a two-man job.

Up to this point the dismemberment of the piano has been largely a question of locating wood screws and removing them; but from this point on the various parts are glued together. Directly behind the plate is the "wrest-plank" in which the pins were embedded. This is of laminated

[*Continued on page* 166]



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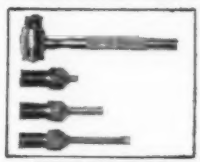

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Shortages Needn't Worry Workshoppers

[*Continued from page* 165]

construction and as the pins did not go all the way through it the back of it is free from holes and can be split off.

The various parts that remain are solid and heavy, and if the craftsman wishes to use them separately he must saw them one from another. There are a number of upright posts in the back (usually of maple) a spruce sounding board with a bridge which is both screwed and glued across it. This must be pried off if the sounding board is to be used. The sides of the piano are fine straight wood and must be sawed away with the grain.

In return for his pains the craftsman will be rewarded with a stock of excellent wood which, were he to buy it from the usual sources, would cost much more than the piano did (and it may have cost nothing at all) as well as a quantity of screws, hinges, wire, small metal parts, and a huge cast iron plate.

What use can be made of such reclaimed material? The answer is "innumerable uses" limited only by the ingenuity and versatility of the craftsman. His attitude toward his hobby may have to undergo certain modification. Instead of making up his mind to build a certain thing and then simply going out and buying the material he needs he now must take a more adventurous outlook and ask himself two related questions:

"What can I build with this material?"

or conversely,

"Where can I find material suitable for completing the project of the moment?"

In the bending of unaccustomed materials to his needs, and in the tracking down of new sources of material he will acquire a liberal education.

"I dunno. Every noon he gets under the car and comes out with a bucket of milk for his lunch!"

Glass Blowing Is Easy

[*Continued from page* 137]

This opening is then to be enlarged by employing the charcoal tip to produce a flare, Fig. 6, as previously described. The other tube is similarly flared, and the jointure made by applying the operation described for Fig. 1.

These three basic operations will provide a start for the would-be glass-blower. Ingenuity and practice should supply the rest of what one ought to know.

Using the blowpipe correctly will call for a few minutes' practice of its own. The whole trick is to learn how to maintain a steady pressure of air through the opening. This is done by puffing out the cheeks and lips with a mouthful of air. Blow steadily, and continue blowing, supplying a steady stream as you inhale and exhale. In this way undesired intermittent pulses of air are prevented.

Make This Micro-Burner

[*Continued from page* 137]

other glass tube, a length of rubber tubing carries the compressed air to the burner. In operating the pump the water is turned on, which draws air in through the side arm. The water and air pass into the bottle, the air leaves through the upper tube while the water escapes through the hole in the side. It may be necessary to attach a bent glass tube to the water outlet so that the water will leave the bottle no faster than it enters.

To use the burner, turn on the gas and light it, then slowly turn on the water through the air pump until a hot nonluminous flame is obtained. A small flame is an advantage in glass blowing in that it permits neater work on small objects than a large flame. This micro-burner is particularly good for joining (and working) tubes up to eight millimeters in diameter.

Turned Cigarette Case

[*Continued from page* 121]

faceplate of the lathe to turn as shown in drawings. For the rim turn 2 rings as indicated. Clamp these two halves together temporarily without glue, while you bore the flared hole. Note: Outer sides of these rings are left flat to facilitate clamping when they are glued together permanently over the body of the case. When the glue is dry you can proceed with the finishing. You will need a cupped shaped piece of wastestock to grip the case while completing the turning, sanding and shellacking. In use you load the case by turning the rim to bring the flared hole over a hole in the body.

Five tons of nails are used every day in crating military vehicles for overseas shipment at a Canadian Ford plant.

Secrets Of The Oil Spies

[*Continued from page 57*]

The can, of course; the one he had bumped his head against.

As carefully as a powder monkey works with high-test dynamite, the scout filled the can. It leaked, but before he could plug the hole, the foreman of the rig, carrying a crowbar, was upon him.

The first lunge missed the scout. The second thrust was short, for the scout, clutching his leaking can of oil, was going away from there. Half a mile further, and much out of breath, the portly scout had gained a safe lead over his pursuer, but he had lost his oil through the hole.

Had he been able to retain his pilfered sample and have it tested, the resulting report on its specific gravity and other characteristics might have increased the value of every lease within a mile of the "no dope hole."

Another scout had more success. The well in question was known to be producing. If production was at the usual depth for the field, the oil should be of 20 gravity. There was a suspicion that the well had been drilled to a new horizon. What grade of crude had been found?

The scout assembled his props as carefully as a moving picture producer-director, and when a tank truck started down the road from the well, the driver encountered what appeared to be a motorist in distress.

The "motorist" hailed the truck, explained he had lost the plug from his crankcase, pointed to the stream of oil on the road as evidence of his plight, displayed a wooden plug he had fashioned to make the crankcase serviceable again.

"So if you happen to have some lubricating oil," the scout finished, "I would be glad to pay you for it."

The truck driver, as the scout suspected, had no lubricating oil.

"Okay," he continued, "if you will give me some of your crude I could limp into town."

The driver would be a good Samaritan, "If you can find a can to hold the crude."

The scout kicked around in some bushes and "found" a can. It was soon filled and the truck driver sped on down the road while the scout, quickly replacing the original crankcase plug filled his motor with lubricating oil he had hidden in the back seat. The crude oil sample he had gained from the gullible truck driver later tested 24 gravity, worth about 20 cents a barrel more than that from other wells in the field and indicated a justification for all owners to drive to a greater depth in search for the better grade of crude.

Another scout was on the trail of information. He was baffled at every turn. The wildcat was as closely guarded as a newly established harem. The old dodge of getting one of his men employed on the drilling crew failed. The crew boss kicked him off the lease.

[*Continued on page 169*]

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"Baby" Carriers—Our New Weapon!

[*Continued from page 65*]

for quick conversion of merchant ships into ships of the Navy for various purposes. The small-scale plane-carrier now becomes perhaps the most important of these several conversion types because each war development brings renewed proof of the value of any measures which contribute to superior air strength.

The ships have a speed, as mentioned, of about 20 knots and apparently have a plane carrying capacity 25 per cent of the 20,000-ton Hornet type carrier, which holds about 100 ships. Construction details are secret, of course, but some experts have speculated on the probability of special catapulting devices—the respected features of the 6,800-ton German catapult ships—combined with retarders for landing planes on the necessarily-short decks of the 10,000-ton "baby" carriers. Landing decks are the advantage carriers have over ships, like Germany's, with the catapult alone.

What can we expect of these baby plane carriers?

In the first place, any mobile base for fast planes is advantageous in this far-flung, world-encircling war. But one of the most effective uses to which these midget carriers could be put would be to add them to cargo convoys. The carrier would have the same protection from submarines as the other ships of the convoy possess. And the convoy gets swift-striking stingers; continuous air patrols from dawn to dusk; falcon-like hunters of the lurking shadow of a marauding submarine; and fast fighter protection against wide-ranging enemy bombers.

Navy men have long realized the vulnerability of the huge *Lexington* and *Saratoga* to submarine attack. The smaller ships are smaller targets and because of the scattering of plane strength, an equal number of "baby"-borne planes would have four times the margin of safety as those based on the large type carriers.

Conceived as an extension of a fleet in battle formation, the "baby" carriers can double the effective scouting range of the fleet. And, further, they could be a means of "softening up" the enemy by air attack before it is in gun range of the cruisers and battlewagons.

Major sea engagements—in the broadside manner—may be few and far between in this war. Air fighting is changing conceptions of battles at sea. But, even if the world's navies avoid the bulldog grip of all-out engagements, the "baby" carrier can serve a purpose perhaps more vital than any other phase in the 32-year history of sea-borne air power.

Thousands of miles of our coastline are open to enemy action. Hundreds of islands are potentially open to attack. And a ranging fleet of MOVABLE air bases may afford the necessary protection and defense against the day when it is time to move against the enemy for the knockout.

Model Farm Buildings

[*Continued from page 141*]

Prepare correct size patterns on paper, first, following dimensions on drawings. Transfer them to the wood, sketching all end pieces on the thick wood of the fruit crate ends and sides and roofs on the thinner wood of the fruit crate sides.

To cut out the window sections, mark the outline of the windows on the wood, bore a hole in the center large enough to allow the saw blade to pass through. Remove the blade from the saw frame, slip it into the hole, teeth pointing downward and replace in the frame. After sawing out the window section, the blade will need to be taken out of the frame again to be removed from the inside. This can be easily done by pushing the saw frame against the edge of the workbench until it "gives" enough to allow the blade to be taken out.

The window spaces in the outbuildings were left blank but those in the house had real windows made of isingglass with the panes marked in India ink. The window glass was fastened on the inside with strips of Scotch tape.

A power jigsaw makes the cutting easier, but a hand coping saw is quite satisfactory. All sections should be sanded as smoothly as possible before assembling.

Assemble with small wire nails. The thick ends of the buildings eliminate all danger of splitting. Paint, of course, adds the finishing touch. The house, in the case of the originals, was painted white with green roof and trim. The rest of the buildings are red with white trim and green roofs.

The farm may be made as simple or elaborate as your abilities and inclinations allow, but for the time spent in construction, you will be well repaid in noting the pleasure of the lucky youngster.—*Elma Waltner.*

Stepped Book Cabinet

[*Continued from page 125*]

The plywood backing is bradded in the rear and the front base mitered and glued to the sides below the compartment.

The two doors in the base overlap ¼" down the center, so be sure that you make them wide enough. They are hung in place with 1¼" brass butt hinges and a small stop and friction catch installed inside. Glass or plastic knobs are then added. Picture moulding or beaded cove is mitered and bradded around the top shelf and on each end of the compartment. The hardware is removed and the entire piece sanded well before finishing with oil stain and two coats of varnish.—*G. E. B.*

Birds puncture grapes and drink the juice to satisfy their thirst.

An altimeter is a barometer with the graduation scale marked in feet instead of inches of mercury.

Secrets Of The Oil Spies

[*Continued from page* 167]

Then, and only then, was the scout prepared to commit larceny, which shows how inherently honest scouts are at heart, and how great must be the provocation before they will break the law. Stealthily he entered the shack in which the well cores were stored until they could be examined in detail at a laboratory. It took him but a moment to realize Lady Luck was on his shoulder for there, practically underneath his hands, were several sections of recently removed cores.

He picked one up, swiftly sniffed its odor, tasted it for salinity. As he thrust it into his pocket, the door opened.

"I am," he announced as a member of the drilling crew entered, "a representative of the United States government—Bureau of Mines," and with great dignity strode away

Fifty yards from the lease, dripping with cold sweat, he sprang into his car and fled from a criminal charge which could have included unlawful entry, larceny and impersonating a federal officer. But he had his information.

The war has given new impetus to every phase of the oil producing game. Old fields are being re-examined by oil detectives in search of either oil bearing horizons inadvertently passed in drilling, or lying beneath the exhausted wells.

Combined with the romance of the oil scout is the exact science of oil detection to be found in the many new devices being developed in the industry. One of the most uncanny new devices in the oil business is the so-called Schlumberger (pronounced "Slumberjay") electric logging machine. Similar to it is the Geoanalyzer of the Lane-Wells Co.

With these electric logging devices, many an oil well sunk into the ground at a cost of thousands of dollars *and then abandoned as a dry hole* has been turned into an oil producer.

In simple terms, the theory of an electric logger is that various types of rock strata offer varying resistance to an electric current. A water-bearing stratum, for instance, is a very good conductor; an oil bearing stratum is highly resistant.

An electric logger is a small device which is lowered into a hole; as it descends, it reports the degree of resistance it meets in each rock stratum on the way down.

Sometimes, a driller will drive a hole straight through an oil bearing stratum and miss it completely, due to the fact that the "mud" in his drill mixture chokes off the oil sand.

In such a case, the electric logger will frequently discover an oil flow in a "dry hole" and turn what might have been a loss of thousands of dollars into an oil bearing well that's worth a million!

Sometimes, in this great gamble in man's never-ending raids upon nature's storehouses, new fields make new millionaires. Other times millionaires

[*Continued on page* 170]

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(Correct Answers to Quiz Questions on Page 78)

1. False. They take off into the wind.
2. True.
3. False. It is a form of marine life somewhat similar to a jellyfish.
4. False. Muscle Shoals is the name originally given a large Tennessee electric power plant.
5. True.
6. True.
7. False. It's the galley smoke pipe aboard a ship.
8. False. It's a flexible shutter release used on cameras.
9. True.
10. True.
11. True.
12. False. Zebras are slow, and lack pulling power.
13. True.
14. False. Special grease is used which leaves no "slick."
15. True. It was carried across the English Channel by balloon, and was received by Benjamin Franklin.
16. False. It's in the Pacific.
17. False. A recent study of 500 herds indicates that larger cows give more milk.
18. True. Owing to the amount of water removed, dried fish has more food value for its weight.
19. False. Baby chicks use more of these products.
20. True.
21. False. Most of these mines are from 2 to 4 miles above sea level.
22. True. It emanated from burning material containing sulphur.
23. False. Most of the engines turn in the same direction.
24. False. This type of cannon usually fires through a short hollow shaft from a gear box.
25. False. They are the dome shaped sliders attached to the bottoms of furniture legs.

Attention, MI Readers!

We will pay $1 for each true-false statement which we find acceptable. Statements will not be acknowledged or returned. Address the Quiz Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York City.

Checks have been mailed to the following: Carol Bunker, Hancock, Maine; Chester L. Marks, Ithaca, N. Y.; Dorothy Ryder, Seattle, Wash.; A. D. Miller, Selma, Ind.; Lucile Cheisi, South Bend, Ind.; Albert Solomon, Boston, Mass.; Joseph M. Reid, Represa, Cal.; Thomas Constantino, Amsterdam, N. Y.

Secrets Of The Oil Spies

[*Continued from page* 169]

are as quickly unmade. But broke or rich, be he a geologist with a Ph. D., or a roughneck with bulging muscles, when oil once gets into his blood he is an oil man still, eager to employ every new apparatus devised by science to shorten the terrific odds of hitting, with an eight-inch borehole, a pool of oil 10,000 feet straight down

The Practical Fireplace

[*Continued from page* 143]

and strength. It is made of concrete. A one-three-four mixture is rich enough. This is a fine place to dispose of scrap iron, bailing-wire, etc., thus reinforcing the base. It is best to pour the hearth at the same time, leaving perhaps an inch low to allow for surfacing. If the fireplace is built up from a basement, then the concrete floor of this basement must be thicker where the brickwork is to start. In this event the work is probably being done by masons and then it will be necessary to determine whether they are right on the points—of-error mentioned. No ash pit has been included in the sketch as it could be easily planned by the builder. Be sure to make the hearth large. This adds much to the attractiveness and convenience of a fireplace.

Fire-box

We will assume the base is in and smoothed off ready for brickwork. Carry the work right on up to the throat. In building a fireplace in a log cabin, I have found it a distinct advantage to carry the log work and the fireplace along together. A tight seal is thus obtained by letting the ends of the logs penetrate the brick or rock-work. The angle to the back of the fire-box may well be handled without the aid of forms. Build the fire-brick up, row upon row, simultaneously, filling in behind with mortar and brick or rock. The desired slope is obtained by the overhang of each horizontal row of brick. If a smooth back is desired then a form will be necessary. A word regarding fireplace construction where rock is used throughout—this procedure isn't advisable. Moisture exists in almost every known type of rock. Thus when rock is exposed to great heat the result is fracture. Common brick for fire-box lining may be used but does not have the life of fire-brick.

Lip, Throat and Smoke Chamber

We have now reached an important stage in the construction of the fireplace; the upper extremity of the angle. Here, we find, many mistakes are made. You will note by the sketch that the *lip* hangs down eight inches lower than the throat. Strange to say, a great many fireplaces are built without a lip With this shortcoming it is impossible to obtain satisfactory results. The small arrows in the diagram indicate the smoke's path up the flue. At all times a portion of the smoke returns down the back of the flue. With a wind blowing or any other retardation to the free passage of smoke, the whirl effect at the foot of the smoke chamber, as shown in sketch, becomes more pronounced. This stored smoke then tends to belch into the room. The presence of a lip prevents this occurrence. Its lower edge should be

[*Continued on page* 172]

Beat The Weatherman

[*Continued from page* 104]

hardware stores. The thumb screw comes up through a hole in the hardwood shelf. The hole is centered on the bottom of the glass jar. Drill the hole small enough so that when the thumb screw is forced in it will cut its own threads.

PIPE STRAPS—These are cut from sheet metal and hold the tube to the backboard.

GAUGES AND SLIDING INDICATOR—The gauges can be cut from an ordinary ruler or yardstick or they can be made. Those in the photo were made. The one on the left shows centimeters and the other inches. The range is from 25⅜" to 32⅜" and correspondingly, from 64½ cm. to 82½ cm.

The sliding indicator is made of sheet brass. It is bent around the gauges and slides up and down on them. The gauges are fastened to the backboard by round head wood screws. Washers between the gauges and the backboard provide room in which the indicator can slide.

When the indicator is set at the level of the mercury a reading can be taken on both gauges. If the indicator is left in place, fluctuations can be measured from it at a later reading.

MERCURY—All dentists use mercury. The price fluctuates. The average price is about four dollars per pound, U.S.P. About a pound will be needed for the barometer here described. Most dentists have enough on hand to supply this small quantity or they can quickly obtain it from their suppliers. The mercury that goes into the barometer should be pure and gleaming. If it is dull from dust that has settled on its surface or if it contains any foreign matter it can be brought back to brightness by forcibly filtering it through chamois.

Assembling The Barometer

(Two people needed.)

1. Fasten the backboard vertically to the wall, truing it with a plumb line.

2. Attach the white point to the backboard, point down, with its lower end about an inch above the shelf.

3. Cut a second hole in the cover of the jar, large enough for the white point to enter all the way.

4. Using the lower end of the point to measure from, fasten the gauges in place. Thus, for example, the 29-inch mark on the gauge must be 29" from the tip of the white point.

5. Unscrew the point and the gauges from the backboard.

6. Pour about ¾" of mercury into the jar.

7. Fill the tube with mercury. This is best done with the aid of a small glass funnel attached to the mouth of the tube by a piece of rubber tubing. Do the job over a clean China bowl or other non-metal receptacle in case any mercury spills. Fill the tube right to the top, there must be no air in it. Watch for minute air bubbles adhering to the inner walls of the tube. Then tap the tube

[*Continued on page* 173]

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The New Crossword Fad in Figures
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Every letter used in a cryptic problem represents a number. There is a different letter for each of the ten digits, counting from 0 to 9, or from 1 to 0 (10). When these ten different values are discovered, the key will appear as a ten-letter word or phrase, starting with the letter signifying either 0 or 1, as the case may be.

These equivalents, when discovered should be written in *immediately* all through the problem, and in the key order. That is, if you determine that a letter, say A, stands for number 4, you must immediately write 4 under every A in the problem, and write A under number 4 in the key row, to spell out the key word or phrase.

CRYPTORITHM No. 11. A Subtracrypt. Key:
1 2 3 4 5 6 7 8 9 0

R A, M M E, D M I, N E S.
R, A I N, A N D, M U D.

A N, N I D, M R I, M I S.

HINTS: This is a Navy key, from a fan. Send some more war keys, folks!

Col. 1: S—D=S. D is 0 (zero).

Col. 11: R less nothing leaves A. So R is 1 more than A, but has "lent 1" to col. 10.

Col. 10: A—R=N. As R is 1 more than A, N has to be either 9 or 8, depending on whether A lent 1 to col. 9.

Col. 7: E—N=D (0) Now N is 9 or 8 but here E is clearly 1 more than N, so can only be 8, and E then is 9.

Try Cols. 3, 5 and 9!

CRYPTORITHM No. 12. A Divicrypt. Key:
1 2 3 4 5 6 7 8 9 0

CREPT) T O J A P P O R T (A E N N O
P C N J N

C R O R R P
C T P T S J

C T C T O O
C A O T O A

C T S S R R
C A O T O A

C A R N P T
C C C R P N

C T A E J

HINTS: You're in the Navy now! A hero!

See last subtraction, 2nd col.: P—P=E. E is zero or 9.

3rd sub., 3rd col.: T—T=S. S is zero or 9.

2nd mult.: CREPT × E=CTPTSJ. E can't be zero, so E is 9! so S is zero! (0).

2nd sub., col. 2: R—S (0)=T. R must be one more than T; so in col. 3 of this 2nd sub., (R—T=C), the C must be 1! And then in spelling the key you'll have the pair TR somewhere, remember.

5th sub., 5th col.: A—C=C. As the C's are 1's, A is 2 or 3.

4th sub., 1st col.: R—A=P. As A is 2 or 3, P is either 2 or 3 less than R. So P is placed in the key, either just before TR, or in the second place before T, thus P-TR. (You are anagramming now—crosswording!)

3rd sub., 5th col.: T—A=C (1). In same way we find T is either 2 or 3 more than C (1). So T is either 3 or 4 in the key! Now, finish!

Solutions to Nos. 11 and 12 will be published in MECHANIX ILLUSTRATED for May. Address answers to NINE-HEX, care of MECHANIX ILLUSTRATED, 1501 Broadway, New York City.

The keys for March were: No. 9: Two Numbers. No. 10: Corn Flakes.

The Practical Fireplace

[*Continued from page 170*]

8" below the throat no matter how large or small the fireplace may be.

Pay strict attention to the construction of the *throat*. This is another vital point. Its width is always 4' regardless of the size of the fireplace. It must extend the full length of the fire-box. If the back and legs of the fireplace have been carried up together, it will be comparatively simple to remember that, 8" below the throat you must place your angle irons across the legs and start the lip. Until that throat opening is complete remember to use fire-brick for there is much heat in this narrowed space.

You will note that the *step* is merely a flat shelf extending the full width of the firebox and at the foot of the smoke chamber. It too is a fixed width with its length determined by the length of the fire-box. This step or smoke shelf is also important.

Directly above the throat, that is to say, in construction of the smoke chamber, the dimensions are gradually diminished until the ultimate flue size is reached.

Flue size in square inches is determined in all fireplaces by this rule: 13 square inches of flue space for every square foot of opening. For example your fireplace might be 30" times 4' in the opening. This means there are 1,440 square inches, which, when divided by 13", gives approximately 111 square inches for the desired flue area. It is always best to allow a bit more for the flue than this result. Make its length approximately twice its width. Thus a flue dimension of 8" by 16" would be good. Be sure to hold the flue walls as smooth as possible since this will promote draft. Never draw this flue to smaller dimensions as you build up, but hold the same completely through to the chimney's top.

Just a word regarding dampers. If you use one it should be located directly above the throat and placed in such a manner as to tightly close the throat when closed. Dampers are only of value on the Pacific Coast to eliminate cold air entering the house in winter when the fireplace is not in use and prevent flies from entering in summer. Where hardwood is easily obtainable, a damper, partially closed, will raise the heating efficiency of the fireplace.

It should also be mentioned that the chimney should clear the roof, dormers and other obstacles by at least two feet. Sometimes large trees near by will prove somewhat of a hindrance to draft.

Carefully observe these instructions and you will be pleased and surprised at the resulting fireplace.

The average driver of a motor vehicle in this country used 724 gallons of gasoline last year.

Glaring headlights may blind a driver or pedestrian as long as three seconds, tests show.

Beat The Weatherman

[*Continued from page* 171]

lightly until they have all come to the surface.

8. Invert the tube and immerse its lower end in the mercury in the jar. This must be done without letting any air get into the tube. A good way is to place a finger over the mouth of the tube, immerse it, and only remove the finger after the open end is under the surface of the mercury in the jar.

9. Slide the cover down the tube and screw it home by turning the jar, not the cover.

10. Place the jar on the shelf and press it firmly into the recess; place the tube against the backboard, taking care not to remove the tube from the mercury while doing so. Secure the tube in place by means of the pipe straps, and the jar by means of the clamps.

11. Replace the white point and the gauges, using the same screw holes that were made when these accessories were originally put in place. Be sure that the sliding indicator is on the gauges before they are screwed home.

12. By means of the thumbscrew adjust the position of the jar until the white point just breaks the surface of the mercury.

At normal atmospheric pressure (fine weather) and at sea level, the mercury will stand in the tube slightly below the thirty-inch mark. If the barometer is used in mountainous country or high up in a tall building the mercury reading will be lower. The mercury in the tube will fall about an inch for each thousand feet of altitude.

When the mercury falls rapidly from its normal position, the approach of a storm is indicated; and when it remains stationary at its normal level, fair weather may be expected.

A very slight and gradual fall does not mean, usually, that any weather change is imminent. By keeping accurate records of observations over a period of time, and correlating them with wind direction and (if possible) velocity, the mercury fluctuations can be correctly interpreted as they apply to a given locality. Once these fundamentals have been learned, the barometer will prove a good weather prophet. The man who owns a barometer can sometimes make a more accurate forecast for his particular locality than he could ordinarily get from the usual sources.

Electric Tank Agitator

[*Continued from page* 97]

with the tubing over it should fit the knob or key snugly. Obviously, before starting, the diameter of the tank with which the agitator is to be used should be measured so that the dimensions of the platform and the distance of the center of the platform from the edge of the housing can be properly planned.

This agitator has sufficient speed to agitate solution in tanks that are not equipped with an agitating key. In the latter case intermittent rather than continuous agitation should be employed.

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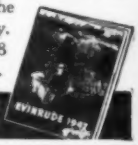

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Garden Barrow

[*Continued from page* 144]

Assemble as shown in the cut-away perspective drawing, applying waterproof glue (Cascamite) on the raw wood of all contacting surfaces and draw down with brass or galvanized screws, countersinking the heads. Grain on the floor should run lengthwise to minimize chipping when using a shovel.

The top frame-members, terminating in the handles, are scroll-sawed out of ⅞" by 8" planks, and reinforced at the curved portions with small bolts, with heads and nuts counterbored and plugged over. Galvanized pipe braces strengthen the front end, and spacers are used on each side of the ball-bearing, baloon-tired wheel. A wooden wheel may be substituted, if necessary.

An effective color combination would be light green on the panels, a darker shade of green over the frame-members and yellow on the wheel disk; a yellow or red on the flowers with dark green leaves.—*Hi Sibley.*

Frames For Winter Snapshots

[*Continued from page* 142]

be changed to suit the builder. The jig-sawed edges of the designs may be quickly polished smooth with a small motor buffer or by hand, using a soft cloth wrapped around a dowel into which has been sprinkled a little buffing pumice. They are finished off with a thin coat of polishing wax.

Either of these frames with one of your favorite pictures is a gift that will delight any winter sports enthusiast, and a few of them will also do much in dressing up any ski club room or personal den.—*M. G. Winterton.*

Greenhouse Bill Of Materials

2 yds. concrete.
160 lineal ft. No. 1 common pine, 2"x3" surfaced. Studs and rafters.
64 lineal ft. 2"x4" common pine, surfaced, Sills and plates.
160 lineal ft. ¼"x¾" battens, surfaced. For between lights.
1 pc. No. 1 common pine, 2"x6" surfaced. Ridge pole.
72 pcs. 16"x24" window glass-lights.
2 sash, 18"x70". Ventilating sash.
1 door, 24"x6' 3".
Hardware: Bracket and hinges for vent; door hardware; anchor bolts, glazier's points, putty, etc.
Material for plant benches depends upon the design preferred.
6 heating elements, sheet iron and thermostat for heaters.

ANSWERS TO CRAFT TEST ON PAGE 134

1. Flat
2. Hand
3. Square
4. Pillar
5. Round
6. Triangular or taper
7. Half round
8. Knife edge
9. Cant saw
10. Cross cut

Lathe-Turned Trophies

[*Continued from page 106*]

cutter to form a series of parallel lines or both cutters to form cross hatching.

Bend the handles from polished brass wire or bronze brazing rod, and solder them in position. Remove excess solder with a knife. Preheating the cup will make soldering easier, if a small iron is used.

Now for the silver finish: You can, of course, have the cup plated by conventional methods. But here is a simpler way that works satisfactorily when carefully done: Obtain some old photographer's hypo—some that has been used extensively for fixing prints or films and that therefore contains considerable silver in solution. Clean the cup thoroughly, to remove all traces of grease; and then handle it with pliers or tweezers instead of the fingers. Immerse the cup in the hypo for about 30 seconds. A uniform silver coating should form on it in that time. Remove and rinse, and then allow it to dry. Another way of applying the silver coating is to dip a wad of cotton in old hypo solution and rub the metal surface with it. Sometimes this seems to produce a more permanent coating than mere immersion. The process of plating with hypo depends on chemical displacement. After the cup is throughly dry, give it a coat of clear lacquer to preserve the silvering.

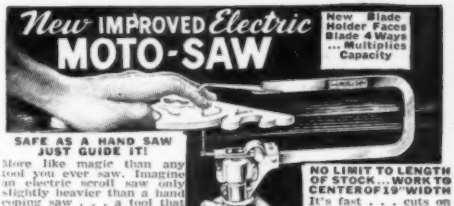
The pedestal is turned from plastic of any desired color, or from hardwood. Often a black finish is used, but the pedestal shown is crystal clear with silvery flecks through it. Drill a hole in the bottom of the cup and tap it to receive a 6-32 stud which screws into a matching hole in the pedestal. The stud need extend only $\frac{1}{8}$" or so into the plastic. A little pyroxylin cement will assure a permanent joint.

Photographic Book Marks

[*Continued from page 93*]

The photographs can either be cut out first and then pasted on suitable background materials, or glued to thin cardboard and then cut out preparatory to gluing them to the lettered portions of the book marks. When gluing photographs directly to leather, the best adhesive to use is cellulose cement.

Other ideas for interesting book marks might include: (1) A small boy, wearing a soldier hat made from newspaper, doing sentry duty with a home-made gun. The lettering might read: "Guarding My Place." (2) A side view photo of an animal, either monkey, dog, cat, etc., cut out on thin cardboard with a long ribbon in place of the tail. Lettering on the ribbon could suggest: "It's a Long Tale, But a Mighty Good One." (3) A still life of a book laid aside on a table, eye glasses resting on it, burning candle in candlestick alongside—picture taken by the light of the lit candle. Lettering on the book mark can read: "To Be Continued," or something more formal.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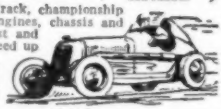

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Home Made Milling Cutters

[*Continued from page* 145]

filed back on the shank for about ¾" and about $\frac{1}{16}$" deep. Mounted in the lathe chuck with the work to be milled clamped on the tool post saddle or in a verticle slide this cutter is exceedingly useful for all kinds of slotting, facing, etc.

Another type of cutter made from the same material in the same manner is shown in Fig. 2. In this case the tappet is used as it is, the cutting teeth being marked off on the head of the tappet (C). The teeth are then filed in about $\frac{1}{16}$" deep with a slight rake of about 4 degrees. For shallow cuts such as fluting model locomotive side rods, etc., this cutter will work very well as is, but for cutting keyways and other similar work a slight amount of side clearance should be provided by undercutting both sides of the head in the lathe as shown at (D).

If carefully made these cutters will work well without further hardening in cast iron, brass, or any other soft metal.—*Gordon Douglas.*

Shop Rack From Cable Reel

[*Continued from page* 145]

Bottom drawing shows the reel in use as a stand or rack for a small electric drill, solving the problem of supplying a place for this tool on the bench where it is instantly available, yet out of the way of other tools or apparatus kept on the bench top. It is advisable to secure the spool to the bench with bolts for this adaptation, especially if the drill is operated for any purpose while in the cradle. A large wood base about a foot in diameter will provide a firm base upon which to secure the spool if it is not desired to bolt it directly to the bench top. Here again, the natural springiness of the metal sides will prove of value by providing a clamping effect on the drill casing and holding it firmly but easily removable in the cradle.—*W. C. W.*

How To Make A Linogram

[*Continued from page* 139]

the roller is still wet, ink the exposed surface of the block, being sure to cover all protruding areas. The wet block is then pressed firmly against the surface to be monogrammed. You will have to roll out the ink for each print made if you want to insure an even texture to your printing, but this takes very little time and the work will progress more swiftly as practice is acquired.

Inks are available in many different colors, and you may even achieve pastel shades by mixing inks with white. After you have tried a few designs on paper napkins, you will be able to decide on the one you like best before going ahead on towels, ash trays, doilies, etc. If you feel unable to design your own initials or monogram, very excellent lettering jobs can be done by tracing from magazine advertisements, books, pamphlets, etc. If you'd like some humor in your finished product, you may even prefer to trace some of the more popular comic strip characters.

The point is, there's no use in failing to enjoy a tall drink just because the accompanying features don't suit you.

Tricks With Balloons

[*Continued from page* 110]

the neck of the red one, *then inflate them both.* When they are inflated you will have a slight air space between. Do the same with the other pair but place the red balloon inside the green one. Tie off the necks securely. To affect the instantaneous change it is necessary to puncture both outside balloons at the same time. This is done with short pieces of pin points wedged underneath the fingernails, preferably the first finger of each hand. When each outside balloon bursts it will instantly contract around the neck of the inside balloon, becoming invisible.

The Puncture-Proof Balloon

In this trick an inflated balloon is placed inside an ordinary paper sack. It is then punctured with a wicked-looking hairpin. The loud "pop" is heard by everyone, yet the balloon is withdrawn from the sack unharmed.

This effective trick requires two balloons of the same color, one inside the other and inflated together as in the previous effect. The hatpin may be pushed entirely through the sack if you take care that it passes through the bottom of the outer balloon only. The space between inner and outside balloon may be as much as an inch as when the outside balloon bursts, the released pressure causes the inside balloon to increase in size.

Sawing Boards From Logs

[*Continued from page* 107]

ripping fence and assures a straight cut. If the blade doesn't go all the way through, either split off the slab and level the unsawed projection with a chisel or plane, or loosen the guide strip, turn the log over, and take another saw cut.

Now remove the guide strip, place the flat side of the log on the saw table, and fasten the guide strip to the log once more. Cut off another slab. The log is now half squared, and the guide strip can be discarded and remaining slabs removed in the ordinary way. If a band saw is used, it must be equipped with a ripping fence. Another way to square up a log is to use a jointer set to take rather deep bites. The bark should be free of sand or the cutting edges will be dulled quickly.

There are several systems of splitting logs into lumber, as shown by the drawing.

The home craftsman usually can obtain wood from such trees as catalpa (which has a beautiful grain), cherry, apple, walnut, and maple. Even small branches 2" or 3" in diameter will provide a surprising amount of material for making picture frames, small boxes, inlay work, and many other things. Before using the wood for such projects, always let it season well. The drying process can be hastened by placing the wood in a warm or hot place such as the neighborhood of a furnace.

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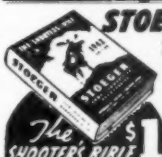

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Professor Wood

[Continued from page 43]

dragged along the surface, would "enable the destroyers to follow the water bloodhounds!"

The British actually trained, or tried to train a lot of seals for this apparently fantastic purpose. Was it all a gigantic practical joke or was Wood really misguided for once, and serious?

Neither this, however, nor any of his other Huck Finn-like escapades and qualities, has prevented the great universities and scientific societies of England from showering on the happy American scientist nearly all the honors within their power to bestow, including the great gold Rumford medal.

While Wood was still a brash young instructor in Madison, Wisconsin, he was invited to deliver his first lecture before the Royal Society in London—the most august and serious scientific body on earth. He was to talk about the behavior of sound-waves and light-waves. Motion picture machines had recently been invented, but the idea of projecting animated drawings on a screen had not yet been conceived by anybody. Wood was the first to conceive it, borrowed a cinematographic projector and flashed motion pictures of the movement of sound waves before the Royal Society. These were the first animated drawings ever shown on a screen in the history of the world, and Wood is still sometimes introduced to laymen as,

"The ancestor of Mickey Mouse."

Dr. Wood is also the discoverer, inventor or "ancestor" of many other now popularly known gadgets, machines, processes. He invented the first color photography method ever used in America, also perfected infrared and ultraviolet photography, had a hand in the development of the talkies, invented the so-called "Vienna method" now used by police and secret service the world over for the detection of superimposed forgeries, raised checks, altered passports and spurious documents.

In what may be called the cruder, heavier, more everyday practical field of applied science in workshops, Wood was the first to produce a stream of atomic hydrogen from which grew the non-oxidizing welding torch. And by a simpler stroke of pure genius, many years ago in subzero weather in Wisconsin he conceived the idea of thawing frozen water pipes with a current of electricity instead of letting them stay frozen till they burst and then having to tear down walls and tear up streets to mend them. Among master plumbers of the world, Wood would be immortal—if for nothing else—for his invention of the "electric thaw."

He is famous in police circles as a great "scientific detective" and as a debunker of fraudulent or misguided scientific cranks, swamis, mediums. Dr. Wood beams with pleasure when praised as a sleuth, but frowns—despite the Electric Thaw and Mickey Mouse—when he is classified as an inventor. He hopes that when he's dead he'll be remembered as another Newton or Einstein rather than as an Edison. This hope may be realized, for when the Royal Society conferred its highest honor on him, it was for pure science rather than for gadgets, Sir William Bragg said in the course of his presentation speech:

"Before the advent of the Quantum theory, when knowledge of the structure of atoms and molecules was very meagre, Wood had made discoveries through resonance radiation of gases and vapors which laid the foundation for our later theories. His work is now classical."

To put it in simpler words, the highest scientific tribunal on earth proclaimed that this American playboy had made the basic discoveries on which the modern material theory of our universe is founded!

Thus Wood will probably have his wish from posterity, but posterity is apparently going to have a long time to wait. Though now past 70 this incredible giant still throws boomerangs, works like a demon, has the digestion of an ostrich—and still plays his outrageous pranks. One day last winter when I was about to shake hands with him he turned his back an instant, then extended his own hand cordially. It was flaming like a blow-torch. He was handing me a warm greeting indeed—a handful of fire—but since he'd concocted it with cotton waste soaked in two parts carbon tetrachloride and one part carbon bisulphide, neither of us got burned.

It's a tricky trick I warn you not to try, however, unless you know your chemistry—well, almost as well—as my friend Dr. Robert Williams Wood.

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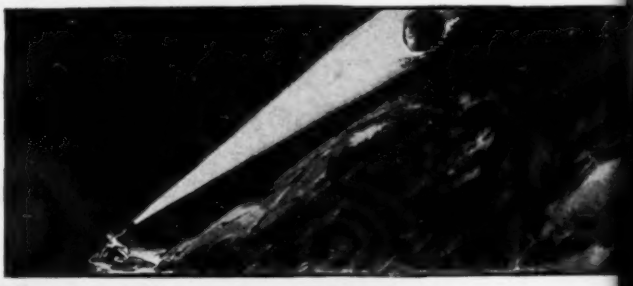
"IT WAS AN OMINOUS roar far up the mountain side—and it brought me out of my blankets like a shot. I grabbed my flashlight and threw its beam up the slope. There in the light I saw a huge boulder smashing down towards me, ripping through shrubs and brush as it gathered momentum.



"I MADE ONE FRANTIC lunge... and sprawled under the ledge beside my friends. The boulder smashed into the protecting rock... and caromed off. Later, we found my watch, which had been *under my head,* shattered to smithereens. Had it not been for dependable 'Eveready' *fresh* DATED batteries, I probably would not be alive today."

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